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IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

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HOUSES IN LOWNDES SQUARE.

SUBJECT OF THE PLATE IN THE PRECEDING NUMBER.

UNDOUBTEDLY it appears somewhat strange, that, among so many publications, professedly treating of domestic architecture, the designs they contain are almost exclusively intended for mansions, or other residences, in the country, as if houses in town required no study, or else afforded very little scope for the display of taste and invention, either externally or internally. Yet, if strange, this is not altogether inexplicable—rather tolerably obvious; the reason being, that, while such subjects are, in fact, more *obligato* in themselves, it is only in very rare instances indeed, that a house is erected by an individual for his own town residence; consequently, no more is thought of than what is likely to recommend them generally to that class of occupiers for whom they are intended, as regards their situation, their size, and their rents.

Those in the same range, whether forming the side of a street or not, are usually quite similar, both in plan and elevation, which last circumstance is rather an advantage than otherwise, at least if any kind of external design is aimed at, because London houses, even those of a superior class, are of such limited frontage in proportion to the height, being seldom more than three windows in breadth*, that, were they treated as separate architectural elevations, they would look merely like so many narrow slips; so that, however good each might be considered separately, the general effect would be that of littleness. The motley appearance that would thus take place—similar to what may be observed in some parts of the Strand and other trading streets—has hitherto been avoided by uniformity of insipidity; by putting the whole of a street or square into one livery, and that of the very plainest description possible, or garnished, at the most, with four lanky pilasters at the angles and in the centre of a range of houses, with a horizontal stripe and shelf above them, intended by way of apology for an entablature.

Of this description is the architectural "magnificence" of Russell, Bedford, and Tavistock Squares; yet, if those and similar assemblages of houses be so far negative in regard to architectural design, they are nearly as negative in respect to architectural absurdity and bad taste; which is very much more than can be affirmed of some of the terraces in the Regent's Park, of the range of buildings denominated Hyde Park Gardens, and of the squares and streets which have lately sprung up in Paddington—intended to be showy, but paltry even to execration—for aught we know, intended to pass for being in the Italian style, though so absolutely hideous, as to make us regret that the unsophisticated John Bull simplicity, which was wont to pervade our street architecture, should have been laid aside in favour of it. Even the architecture of Belgrave Square is by no means unexceptionable; it being, in fact, stamped quite as much, if not more, by littleness of manner and insignificance, as by any better quality. While there is a great deal of pretension and pomposity, there is also no little that is decidedly uncouth and vulgar in taste. The general physiognomy of the architecture may look, at the first glance, somewhat *monumental*, as the French express it; but, at the second, we discover it to be little better than patchwork, with odds and ends of finery stuck about it here and there, with very little propriety, meaning, or expression of any kind. The details are insufferable throughout; and the bare and scanty entablature which surmounts the fluted Corinthian columns, produces a most barbarously incongruous and miserable effect, which is all the less excuseable, because both entablature and columns might very well have been spared, and the design have been improved by such omission. Among other solecisms—and the whole is little better than a compound of them—not the least barbarous is that of shaping the balusters to the balconies, like fluted Doric columns, diminutive in size, but most tall and lanky in their proportions. No doubt, precedents for this whim may be found,—the *classical* Sir Robert Smirke has been Goth enough to indulge in it; but a precedent is not always an authority, nor can it sanction what is preposterously bad taste in itself.

Whether it can be said, or not, to do so satisfactorily, the circumstance above noticed sufficiently explains why so little—in fact, scarcely anything at all—has hitherto been published relative to private residences in towns, while so much, such as it is, has appeared from time to time on the subject of country houses of every description. As regards their external architecture, it must be confessed that houses towards a street do not afford so much scope for design as those which are not only insulated from, but altogether independent of other buildings. Besides that they must range with the rest in the same line, they must, in some measure, conform with them in other respects. Some kind of keeping, as to general character, must be preserved, otherwise, even if of considerable extent in themselves, the individual houses have a squeezed-up look, while an entire row of them becomes no better than architectural patchwork, as is strikingly the case with those facing the Green Park, which form a strange architectural hotchpotch, devoid of any other sort of consistency, than that it is a jumble of insignificant parts nearly throughout. From that extreme, we have since passed to the very opposite one—no less preposterous, and perhaps even more wearisome. House is sometimes added to house, to form a single *façade*, so absurdly outstretched as to length, that it is almost impossible to see it otherwise than piecemeal, or to feel the regularity intended to be produced by corresponding parts equidistant from the centre; perhaps hardly to ascertain, without some calculation, which is the centre of the whole.

* Not small was the disappointment and astonishment we felt, on our first visit to the metropolis, at finding the "magnificent" squares and streets at the West End, of which we had previously heard so much, to be no better than agglomerations of narrow-fronted and very plain-looking houses; therefore, so far as external appearance is concerned, by no means to be compared with some we have seen in a country market town, less lofty, indeed, but having a range of eleven, or even thirteen windows on a floor.

41. 9. 14. 86.

Consequently, the effect which should result from uniformity is completely lost; what should be unity, becomes no better than monotony; and, while grandeur is aimed at, nothing better than littleness and insipidity is obtained. To say nothing of the bad taste it displays in other respects, Chester Terrace, in the Regent's Park, affords a notable instance of such over-vaulting ambition. So far from being of an imposing aspect, it does not *impose* upon the eye even for an instant, since it is evident, at the very first glance, that, instead of being one extensive pile, it is no more than one side of a long street, whose houses are alike in elevation, or sufficiently so to produce the sensation of the wearisome sameness arising from repetition. This sort of architectural *prolixity*, as it may not inaptly be called, just serves to make us feel all the more strongly the contrast between the extravagant pretension of the whole, and the diminutiveness of the individual parts and features, which are all upon a very ordinary scale, therefore, small even to meanness, in comparison with the inordinate length, which is such that, were the whole in reality a single building, it would require to be broken into separate and boldly defined masses, so as to obtain variety, both as to outline and in other respects.

That mere *prolixity* does not contribute much towards, in fact rather detracts from, architectural grandeur and dignity, the unfortunate example we have just quoted but too convincingly proves. It can satisfy only the most vulgar taste, or those who see grandeur in size alone, and where the asthetic elements of it are altogether wanting. On the other hand, we have proof no less convincing, that greatness of manner, dignity of style, and striking effect of design, may be produced within a comparatively limited—certainly a moderate compass. Of this, we have satisfactory evidence in the Reform Club House, which so far stands *facilé princeps* among all other buildings of its class in the metropolis. Yet, let us imagine that *façade* stretched out to the interminable length of some of those by Nash, in the Regent's Park, and, though the elevation would, in other respects, remain the same, its effect would be materially impaired. Chester Terrace would make a score of Reform Club Houses—an entire side of Pall Mall; but instead of being, on that account, more noble in character, it is chiefly remarkable for trumpery pretension, or pretension and *tromperie*, and for architectural bombast, bordering upon the burlesque. How infinitely better would it have been in every respect, if, instead of being drawn up in regiments, the houses composing the "terraces," as they are oddly enough called, in the Regent's Park had been divided into smaller groups, detached from each other, and just of such extent, that each should present to the eye a well-proportioned and well-combined whole. One advantage attending such disposition is, that a much greater number of designs, and we hardly need add, of infinitely superior quality to those we now behold, might have been obtained with the same number of houses. Another is, that the outer road of the park would have been of less townish aspect, whereas, at present, though the park itself may pass as sufficiently *rus in urbe*, the buildings look like so many streets besieging the country,—like John Nash's troops drawn up in formidable array around it.

In our opinion, the direction taken by Nash was altogether a false one in itself, leaving out of the question the taste—or rather the utter tastelessness which he displayed; the superficialness and feebleness of design; the vulgar mawkishness of his detail; and the mixture of trumpery architectural bombast, with the most offensive penuriousness and meanness. One decided error of his consisted in the lavish application of columns, which, though of very ordinary commonplace character in themselves, nevertheless serve to render everything else more trivial and petty in appearance. Not only are they introduced without any sort of motive or propriety, but they rather encumber than adorn. Yet we have heard fertility of invention ascribed to him; and, indeed, if ringing the changes upon vulgar and stale architectural commonplaces be invention, he may be said to have possessed it. But geniality, or aught approaching to it, he assuredly did not possess. There is no evidence of it in any one of his buildings; nor, putting all of them together, do they display so much study, so much knowledge of combination and application, as are shown in the south front of the Traveller's Club House—that beautiful specimen of *astylar* decoration, at once chaste and rich in its effect.

Nash's unfortunate system is all the more to be regretted, and therefore to be condemned and exposed, because it has since been so extensively pursued by others, as in some respects to deteriorate our modern street architecture, substituting for *no-character*, the character of meretricious tawdriness. As far as taste is concerned, the so-called *improvements* at Newcastle, and many other places, are far from deserving such names, they being little better than so many samples of showy vulgarity, and ridiculous architectural finery—of that style which consists in sticking columns and pilasters between windows that are merely so many holes in the walls, and which, therefore, displays merely the rags and tattered frippery of Grecian architecture. While they enhance meanness, columns are made the excuse for it, inasmuch as they leave no space for that decoration, which, if any be introduced at all, ought at first all to be bestowed on those parts and features which are indispensable to the structure.

At length, however, a beginning towards a more sensible and natural system, based upon consistent principles, has been made in the range of buildings forming the south side of Lowndes Square, the elevation of which was given in our last Number. It has been generally remarked by almost all whom we have heard speak of it, that they have been particularly struck by the expression of loftiness which characterizes it, in a far greater degree than anything of the kind in the metropolis. This arises from the elevation not being broken vertically into a number of horizontal divisions, piled up one upon the other, and so arbitrarily, that when the principal cornice, which ought to be the natural termination of the building upwards, is reached, the fabric is still carried on, and suffered to terminate in a few scanty mouldings and blocking courses; or else, perhaps, in a balustrade through which is perceived another tier of windows in the roof, and, consequently, so many blemishes to the whole. Where columns are employed, such division of the elevation can hardly be avoided, if more than two tiers of windows are required, it being impossible to introduce a greater number within the order itself, without forfeiting proportion altogether: consequently, when three or more stories are required, that circumstance alone ought to convince the architect of the impropriety of introducing an order, and accordingly determine him to reject it.

A very flagrant instance of the incongruous effect attending three stories, or ranges of windows, placed within the intercolumns of a single order, occurs in the *façade* of the Royal Institution, Albemarle Street. Its only merit is, that it plainly tells its own story, for, without knowing that such is really the case, we should at once guess that the columns had been inserted into a front not

originally intended for them, it being full of windows from top to bottom, and the piers being much too narrow in the first instance. It must, indeed, be admitted, that the course pursued by the architect was the least *troublesome* he could adopt, because the columns required no study in designing, and they being introduced, there was no room for other decoration or design—nothing more to be done than to put meagre, bald-looking architraves to the windows, which, in consequence, now form a far more striking than artist-like contrast to the fluted shafts of the columns themselves. While the order is Corinthian, the house itself is of most ordinary physiognomy, and so far from being at all classical in character, the whole is no better than a combination of incompatibilities, without any attempt to reconcile them at all.

Where windows must of necessity predominate, they should be made to regulate the style and composition of the design, and be treated, not as secondary features, but as the principal ones, for such, in fact, they really are; whereas columns, even when introduced with taste, are little better than adscititious embellishments. So far from occasioning sameness of character, such mode of proceeding would rather tend to get rid of that exceedingly disagreeable degree of it, which now pervades the greater part of the architecture of the present day, wherein little more than a single unvaried style of window is admitted.

(*To be continued, with Plans.*)

SUICIDAL ARCHITECTS.

The greatest peril to which the fine and elegant arts are exposed, is that of becoming mere matters of pounds, shillings, and pence. This deprives them of that lofty and independent spirit, without which there can neither be spirit in design, nor skill in execution. It reduces the painter, the architect, or whatever else he may be, to the mean degradation of a mere merchant, whose only aim in his business is the accumulation of money. While we say this, we must not be understood to insinuate, even by implication, that there is anything actually dishonourable, or at variance with the morals of society, in the mere fact of being a merchant. The Roman *Fur* did not necessarily mean a man who was obnoxious to the laws above the rest of his class. It applied not to the man himself, considered as a man, but to the occupation which he followed, and to the moral and intellectual influence which that profession had upon him, and through him, upon the general character of that society of which he was a member. It is possible that the Romans may have overstrained the distinction, and given the contrast of the mercantile and unmercantile classes more breadth than it was entitled to.

But they were right in the main, and distinguished not merely one individual from another,—which is scandal, but one trade or occupation from another—which is philosophy. We, too, have our distinctions of classes, sometimes without any relation to their merits. Thus, for instance, we draw a broad distinction between a lord mayor and a beadle, between a home secretary and a common gaoler, and between a field marshal and an executioner; and yet, when we analyse the status of those parties, we find that the difference between them is much smaller than common report makes it to appear. Pope's truism, or, rather, nonsenseism, applies with much aptitude here:

"Whate'er is best administered is best."

We call this a nonsenseism, and we think we are justified in so doing, because, the better anything bad is administered, the administration of it is the worse, as bearing on the welfare of mankind: so that, if the office is essentially and really bad, it always becomes worse in proportion as it is more diligently executed. We can, therefore, ground no general conclusion upon the kind of office, any further than, as such conclusion rests upon public opinion, and public opinion fluctuates so much with fashion, which is in no respect a matter of philosophy and common sense, it cannot be made an element in any well-founded opinion. If, again, we form our judgment from the characters of the men, we are just as much at a loss, if not more. Thus, for instance, there may be, contemporaneously in the same city or town, a lord mayor who is a disgrace to his office, and a beadle, the propriety of whose official doings may, for the time, exalt the beadleship high above the mayoralty—in use, in respectability, and in honour.

We mention these little facts—and they are truisms—in order to show how carefully we must sift society before we come to any conclusion as to the relative values of its different classes, and the degree of honour, or the reverse, which attaches to the very same action, or course of action, if performed and carried on by means of different professions or occupations.

Society may be considered as made up of three sections: those who live without occupation or trade; those who live by professions; and those who live by trades. The distinction of rich and poor has nothing to do with either of these sections, neither has what is usually termed the distinction of high and low; and perhaps it would be as well, if the second and third were considered as subsections, and those who are idle, and those who work, were made the grand divisions. With the first of them, we have, in the meantime, very little to do; our proper subjects of consideration being those who live by trades, and those who live by professions; and, in every nameable trade or profession, there may be an almost endless difference in degree: as, for instance, from the Lord Chancellor, to the bumbailiff and pettifogging lawyer; from the most honourable and skilful physician, to the basest advertising quack; and in the constructive craft, from Charles Barry, to Messrs. Burnisher and Brazenface.

In each and all of these, however, there is a distinction which the higher members possess, and the lower ones counterfeit, and it is this which forms, as it were, the barrier between professions and trades; the latter must not aspire to possess the characteristic of the former, otherwise they will not succeed in their own craft; and the former cannot have the object, or practise upon the principles, of the latter, without losing caste, and being degraded and disowned by the honourable part of their profession. The distinction is as broad and clear as a distinction can be: the professional man has his reward and his glory in that which he does, without any reference to the mere money which the doing of it may bring him; and, on the other hand, the tradesman cares little or nothing for the trade—the use or the uselessness of that which he has to do—for he looks for his sole reward in the pecuniary return. The professional man has a love for the production of his labour, and a pride in the doing of it well—nor is he deprived of these, though the labour is a total loss to him in a pecuniary point of view; and we have had many instances of men, the very foremost in their professions, toiling through

life in obscurity and poverty, without even a hope, save that which had its realization in the future. The tradesman is the very opposite of all this: he cares not one straw for the intrinsic value of the commodities which pass through his hands; for, if those commodities form part of the greatest bane of society, a shilling, procured by traffic in them, is as dear to the tradesman as if they were its greatest blessing. All this, too, without, any vice or crime, real or implied, in either the one party or the other, for, in a tradesman's view of the matter, money obtained by dealing in dust or night soil, by letting houses to disreputable tenants, or by working human beings under the lash, is just as reputable as if it were gained by traffic in gold or diamonds, or in the most essential articles of human consumption. With professional men, this is not the case. They love and value what they are engaged in for its own sake; not on account of its money value, but because it contributes to the gratification of the higher powers of mind, and tends to elevate the character, without any specific reference to filling the pocket.

Corresponding to these two subsections of mankind, there are two objects; the one of which is to increase the wealth of the society, and the other to turn this increase to honourable account, in finding new gratifications for the whole people, and rendering all their gratifications more ornamental. The first of these objects is valuable in itself, because, without the requisite wealth, a nation cannot afford those ornaments which at once create and gratify a high taste. But the second is also highly essential. Mankind are all originally gross and vulgar in their tastes; and those who are well acquainted with the habits of retired tradesmen, know that the mere acquisition of wealth, by what means soever it may be acquired, does not, and cannot, of itself, produce this taste: for instance, a tradesman may acquire great wealth, and retire, in order to enjoy that wealth at his country residence, where he may live at far greater expense in all parts of his establishment than a man of the most refined taste, and yet the whole of his costly establishment may be utterly tasteless, and himself miserable. Genuine taste, and the true feeling of what is really honourable and refined, are not to be acquired in the evening of life, after all the feelings have become blunted, and the mind has, like a mill horse, been habituated to one dull routine of business. The tasteless man, who retires to enjoy his wealth, however great that wealth may be, only accelerates his passage to the grave, and renders it more irksome and intolerant, than if he were to toil and moil in the shop, until he fairly dropped down dead at the counter or the desk. He may have all the good things of the world as completely at command as money can make them; but there is one thing wanted, which destroys all zest and all happiness. Money will not purchase the proper means of enjoying those comforts and elegancies of life, of which money can afford the price. Therefore, the man who retires without having the requisite feelings of taste, has no alternative but sensual dissipation or grumbling to his grave, loaded with a weight of misery. This is a state which is far more insupportable than the depth of poverty; and in this way many, who have not only committed no crime, but have become wealthy by the most honourable means, suffer more from want of taste, than the criminal does from remorse of conscience. But they are not only miserable in themselves; for the misery extends to their families, and the want of taste in the parent is but too often the cause of want of proper conduct in the children: the sons are exposed to the temptations of the worthless part of what is called the fashionable world; and these, their fashionable companions, very speedily make them squander that money which the father has accrued with such laborious care. It is even worse with the daughters; for, as the father has no idea of greatness, save what is connected with title, and as the sons of such men are seldom the stuff that even lords are made of, the aspiring and sapient father lays out a considerable sum in purchasing a junior sprig of nobility for his daughter. We have recently had pretty striking examples of the results of unions with these bought lords; and, indeed, the whole case shows that the state of things is still the same as it was in the days of Pope, and that his story of Sir Balaam is no fable. Seeing, then, that the parties have in themselves no active principle of improvement, it becomes necessary to ascertain where such a principle is to be found; and the result of the inquiry is, that it consists in taste, and that the greater the wealth is, the higher must be the degree of taste to keep it from running to folly; for its tendency that way is always in the joint ratio of its strength and its gravity. But, estimating upon the average of all ranks and conditions of men, Britain is becoming more and more wealthy every day. What is called the unsoundness of society, is no proof of the contrary; for countries, like carts, often break down from excess of momentum and velocity, and the circumstances which bring trade into confusion are, with us, not poverty, but the abused excess of wealth.

How is this to be counteracted? Clearly by means of taste; and by keeping that subsection upon which taste depends, to their proper character and duty, so that they shall not be degraded by anything of a mercantile nature. If our wealth is to do justice to itself, and to that country in which it has been won, it must be controlled by good taste, and the parties who regulate this taste must by no means be swayed by any mercantile bias. They must look to what they have to do, and do it well, as the main subjects of their consideration; and leave the finding of the money, even for their own personal remuneration, to the men whose business it is to deal in money. By such means they keep themselves pure, and execute public works in the best manner; and can gradually introduce into the country that good taste which is so highly desirable.

No order of professional men have this so much in their power as architects. Musicians are mere men of momentary sounds, and whatever may be the talent and experience necessary to produce those sounds with such perfection as they are produced by the higher practitioners of the art, they are still not only confined to the parties hearing them, but in respect of duration they are as fleeting as the winds. The labours of the painter, again, are not so perishable as those of the musician; for, while the latter are merely sounds that cannot return in any other way than to the memory, the former have an endurance to the eye. We are far from denying that, to those who have the proper feeling of them, musical reminiscences are among the sweetest subjects of memory; but we speak not of those who are already possessed of tasteful feelings, but of the general mass, who have not only the feeling but the desire for the feeling to acquire. To such, the works of the painter afford a more palpable stimulus than those of the musician; and it is on account of this address to a greater portion of the public, and not to any superiority of the one art over the other, that we allude. Were such an allusion at all germain to the art, the science, or whatever else it may be called, that which attracts the smallest portion of educated society, is perhaps the highest in itself, though its influence on the public is more limited.

As the works of the painter influence a wider range of society

than those of the musician, so the works of the architect influence one wider than either. The works of the painter are deposited in galleries, saloons, and other apartments; so that, however ornamental they may be, the space which each ornaments is confined within four walls. Not so with the productions of the architect: they stand exposed to the whole people, and their influence is felt by every one. There is not, for instance, a single inhabitant or visitant of London who does not feel a certain mental elevation after having visited St. Paul's, and the same may be said of every public work worthy of the name.

The necessary conclusion to be drawn from this is, that we are to look to architecture more than to any other art for the improvement of the public taste, and along with that, of the public morality and virtue. Hence it is especially necessary that architects should be totally free from the pecuniary or mercantile bias, so that the architecture of the country should be conducted upon the principles of taste, and upon no others.

We have deemed it necessary to enter thus far into the general question, in consequence of certain rumours which we have heard, and which, if they are true, as we verily believe they are, are calculated to do serious injury, not only to the profession itself, but to the influence which that profession should have upon the taste of the country. It seems that Mr. Savage was engaged for the repairs of the Temple Church, and that the actual cost so greatly exceeded his estimate, that he was removed from the job, and Mr. Sydney Smirke and Mr. Decimus Burton appointed in his stead. Messrs. Scott and Moffat obtained the prize for the Infant Orphan Institution, on the ground, we believe, of the pretty drawing and the low price jointly; but when the drawing and the estimate were brought to the test of practical men, the very lowest estimate given in by these was three times as much as that given in by the engineers. We have heard of something of a similar kind near Lincoln, and shall be very glad to notice any other instances which may be faithfully reported to us, being well aware that such matters are disgraceful, and must ultimately be ruinous to the architectural profession.

BURNISHER AND BRAZENFACE:

(BEING THE SUBSTANCE OF A COMMUNICATION.)

It always gives us great pain when we fall into any mistake, respecting what a professional man does or leaves undone; and we are always thankful to such correspondents as point out these matters, because that enables us not merely to make the *amende honorable*, but shows how very willing we are to be put to rights in matters of mistake or error, however trifling. Our duty to the public, as independent journalists, constrains us to insert, faithfully and without feeling on our part, whatever appears to be feasible in itself and well authenticated; and if what is thus stated be gainsaid, the same duty requires us to publish the answers, and leave the decision of the matter to the parties and the public.

The inaccuracies which our correspondent alleges that we have published respecting those mighty men of Gath—or Gotham, are of the most venial kind. Positively we have not accused them of any act or intended act of an incendiary nature against the Thames, or even the more inflammable contents of Fleet Ditch; and, negatively, we have not brought against them any charge of neglecting their own interest, or omitting any means whatever of advancing the same. Thus, there can be no moral turpitude in what we have published. Again, we think we are equally scratch-free on the score of philosophy; for we have not even hinted that they give the smallest credence to the production of reptiles by the slime of the Nile, of frogs and infant fishes by the atmospheric turmoil of a thunder storm, or the distillation of Pimilodes in the seven furnace heat of subterranean volcanic waters, or in watering a stone until it was all instinct with myriads of little lives, as alleged of himself by "a shrewd philosopher" of the present day. Having rounded these matters without touching, we flatter ourselves that our case is as invulnerable upon philosophical grounds, as we have already shewn it to be upon moral ones; and therefore we may fearlessly defy the scrutiny of the most lynx-eyed critic in the world

Still, however, we despise to rest the case even upon those grounds; and so we fairly bring forward the charges against us, and let them plead for themselves, if they feel or fancy that they have any *locus standi* in the court of the discerning and impartial public.

First, then, it is alleged against us, that we have charged Messrs. Burnisher and Brazenface with catering jointly for the raw materials out of which they have manufactured their own original plans; and that we have accused Mr. Burnisher of dressing them up, just as if he had been licking into shape infant bears on the shores of the Polar sea. We were told, and we still believe, that this was the early state of things, and if that state has been changed now, the means of effecting the change have been derived from the practice alluded to. Our last correspondent declares, positively, that there has been a change, and that the pills which the public now gulp down from this quack manufactory, are not gilded to the gulling lustre by Mr. Burnisher, but by a young man whom the pair keep in their employment, and *inter alia* prevent from doing anything on his own account, so as to form a connection and ultimately gain that status and independence in the world, for which nature and study have so well qualified him. He is said to be possessed of excellent talents as an architect; and to be well qualified for obtaining a high place in his profession, in spite of fair and honourable competition; but, circumstanced as he is, this is out of his power,—his talents might as well be at at the bottom of the Red Sea, and himself a mere mechanical engine to make plans for the advantage of Burnisher and Brazenface; and thus bring degradation and ruin upon himself, just because he is mean enough to sell himself to these cunning men, as a paltry tool for imposing upon the deceived and swindled public. We are sorry to make use of these terms, and especially where a young man of talent is concerned, but his talent is the gall and bitterness of the whole matter, as, without it, the deception could not be carried on. We do not say, because we have no evidence for saying, that this fraud upon the public is inherent and hereditary in the young man; but he has made it his own by purchase; and, on this account, his moral turpitude is more gross and deep than if, like Falstaff's treason, the fraud had "lain in his way and he had found it." Therefore, in drawing our attention to this subject, our correspondent has not removed one tittle of the onus from the carcases of Messrs. Burnisher and Brazenface, but has merely found a *particeps criminis* in so far as they themselves are guilty.

Come we now to the second crucible into which our correspondent has poured the molten lead of his objection. We stated certain matters to have been done, and latterly it seems they have not

been so. The second form to which we now advert, is the accusation of our having omitted to do, or rather to tell of, certain things which actually have been done, or are *in petto*. One of these consists in our omitting to make known how well Mr. Brazenface can carry any matter by a *coup de main ;* and, in order to make all the reparation in our power, we shall endeavour to tell it now. On the 24th day of July, or on some other day of that, or the preceding, or the following month, the foundation stone of one of those buildings called charities, was laid by the highest elected subject of her Majesty, with all the ceremonies, and in presence of the usual spectators on such occasions. We are not exactly informed as to the nature and designation of the new establishment which is to be housed in the mansion, whose foundation stone was laid with such honours. We believe, however, that it is intended to be a sort of refuge for the infant destitute, meaning thereby, the illegitimate children of persons of quality, who are now, in virtue of a recent statute, the most utterly destitute race of outcasts within the four seas. It may be that the one parent possesses an income of 10,000, 20,000, or any other number of pounds in the year; and that the mother of the outcast, or any of her relations, has not one penny of annual income. It may happen too, and it generally does happen, that the outcast child is a progeny of seduction; and that thus the father receives a large bribe for having seduced a young woman. According to the old-fashioned notions, this would be accounted very bad, both in equity and in morals; but, thanks to the spirit of improvement which is abroad, a male person of quality may now commit any crime that he chooses without incurring the slightest disgrace. This is an excellent means of keeping up that dignity of the male sex, which would otherwise be in great jeopardy. The theory that women are soul-less mortals begins to be exploded; and hence the necessity of imposing some new burden upon that most over-bearing sex. Whether the burden inflicted by means of this law is or is not the wisest one that could be imposed, is a question on the solution of which we are not called upon to enter; but, at all events, it has been contrived by the very wisest of men, which, in as far as it goes is a proof of its wisdom.—Our main and proper business is to consider, not the wisdom or the folly of the laws, but a subject of tenfold more importance—the valour of Mr. Brazenface; and the public will be glad to learn that so great a man in other respects is by no means wanting in this. As has been said, a public meeting was recently held for the purpose of doing justice to the illustrious consort of our our gracious Queen, and to the more illustrious Mr. Brazenface. According to the adage, charity is not in its element if it does not begin at home—whether it ever quits home or no,—and with some people it has the character of being no great traveller; and in what is a genuine Briton more at home than in the deglutition of a substantial dinner. Wherefore, in order that Mr. Brazenface and the other illustrious guests assembled on the occasion alluded to, might be English in their meals as well as in their mettle, the finale, to use the slang expression, "came off" in a dinner. It will be readily understood that the infarctive powers of Mr. Brazenface must have been highly gratified at this display, which was something more than sitting at the gate of King Ahasuerus, or at the feet of Gamaliel; for this prince of architects sat "cheek by jowl" with the especially chosen Prince of the Queen of the British islands, and if that was not a seat of honour greater than any such seat previously named, we shall give up all "sacral dignity" of the human race, to the utmost term of our mortal life.

We do not say that the heating effect upon this highly talented individual was so great as to melt brass, and thereby convert him into a molten image; but, still he was "very hot," *superaque infera*, and wished for all sorts of things to "cool his coppers." During the infarction, and for a little while after, the state of things was bearable; but when the mash of matters began to welter and ferment *in ventriculo*, his nether man was worked into a state of downright rebellion—as bad as that of Etna in in a cholic, so finely described by the Roman bards; and he grasped whatever was within his reach, and clutched at what was not. Now, it so happened that among the latter there was a serried phalanx of ices which a gentleman present had purchased to keep some ladies cool and comfortable, and which, therefore, were his private property, and not part and parcel of the public feed. Such, however, was the internal torrification of Mr. Brazenface, that he would have robbed—of an icicle had there been one there. As it was, he seized the cooling condiments *more* Johnny Gilpin with the horse's mane, that is, he grasped the ices "with both his hands, and eke with all his might:" the rightful owner made a stout resistance, and hard words were bandied to and fro, until the English language fairly broke down under the fury of the turmoil. Mr. Brazenface could stand it no longer; and so, changing from Brazenface to Brazenfist, he collected all his vigour into one furious blow, by which he felled his antagonist to the earth. The scene which ensued beggars all ordinary description; but it showed that Brazenface is a "brave hand at a hammer;" and, therefore, exactly the sort of stuff out of which to make an architect that can peg and fashion matters to some purpose.

We should not have mentioned this little anecdote, had it not been to show how admirably this eminent person is qualified for the work which he has undertaken: he has had to fight against fearful odds: against this odds he has still to carry on the warfare; and therefore it is important that his loins should continue girded with strength proportionate to the weight which he has to bear. That they will continue so girded, is a question upon which we have not the smallest doubt; and, confiding as we do in the perfect stability of the man, we are quite at our ease on the question of his competence. This gives us great pleasure; because, when we find him taking upon himself the burden of more than usual weight, we are always happy when we find him able to bear it. There are two little matters to which we should allude. In the first place, there is the trust-worthiness of our informant; and in the second place there is the truth or falsehood of the story itself; but both of these we leave to a future occasion.

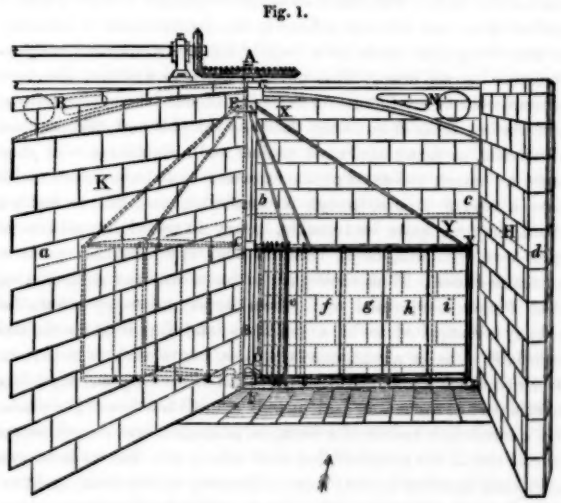
TIDAL WATER-WHEEL.

SIR,

I TAKE it upon me to trouble you by sending drawings and a description of a steam wheel. Some time ago I observed in one of your numbers, a few *Hints to Mechanics*, by an able and friendly correspondent, Mr. James Scott, Broughty Ferry, amongst which was one stating, if it were possible to construct a machine, so as to render the ebbing and flowing of the tides available as a *Prime Mover*. I turned my attention for some time to his suggestion, and now I send you the enclosed design, as the result. Fig. 1, A B is a vertical axletree, and thereon are affixed the two naves C and

D, having in each five spokes or arms, equal-distant with those in C, placed exactly above those in D, and at any convenient height that may best suit the depth of water the machine may be working in; *yz* is a bar fastened to the arms *zf*, *yc*, *xy*; another bar as a support, with similar bars, as *xy*, *yz*, to all the arms; F and G are brasses for the shaft working in; *e f g h i* are valves working on studs or pins, such as A B, fig. 2, and being made a little broader than the stud-ways of the others adjacent, as seen in the arm C D, fig. 4: they cannot pass. There are similar valves in all the arms opening to the same side; K H is mason-work, in order to direct the course of the stream; the dotted lines *ab*, *bc*, *cd* represent the supposed height of the water, moving in the direction of the arrow, and pressing on the planes of all the valves on one side of the machine; while on the other side the edges are only presented to the current, as seen fig. 4, in the arms O P, E N; and by a peculiar construction of the mason-work K E, H F, fig. 4, there is an eddy formed behind the corner E, as represented by the

Fig. 1.



arrows, which nearly overcomes the counteraction of the water altogether; a similar effect is produced at the corner F, supposing the water to flow in an opposite direction, neither is the motion of the machine reversed by the change. Fig. 4, A B, are beams in order to support the axletree; fig. 3, represents the lower end of the axletree and step-brass, A, axletree, B, the brass, C, a hollow cylinder, open at the bottom with an airtight cover, (like an inverted tube,) and the axletree fixed airtight in its centre, the inside of the cover placed a little above the top of the brass, B; D part of a tube

Fig. 2.

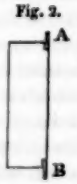
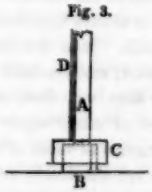
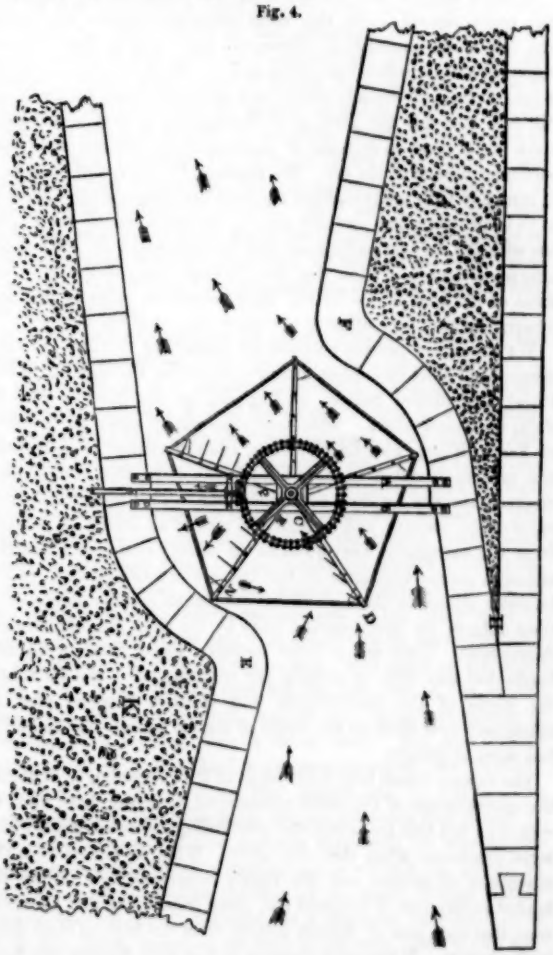


Fig. 3.



supposed to reach the top of the axletree, the lower end of which is introduced into the cylinder C, and having a small forcepump attached to the upper end of the tube, which may be wrought by the machine, air can be forced into the cylinder, which will displace the water and keep the working part dry, and also may be lubricated by the same apparatus.

Fig. 4.



I say nothing in reference to the power of any such machine, as such a problem is not easily solved; but Tredgold discovered, in the experiments which he made with a potamometer, the following results: that water, moving in a perpendicular direction against a plane, equal to one square foot, at the rates of 1, 2, 3, 4, 5, 6, 7, 8, 9 miles per hour, gives the corresponding forces, 2·1, 8·4, 18·9, 33·6, 52·5, 75·6, 102·9, 134·4, 170·1, of pounds on a square foot.

There being many promontories where currents move 4, 5, and 6 miles per hour, a machine placed under such favourable circumstances, would evidently be very powerful; it might also be used in rivers where there is no fall.

This suggestion may be useful to many; and should you deem it worthy of admission into your valuable columns, it would certainly yield a source of gratification to

Your most obedient servant,

SAMUEL LAING,

Dundee, July 10th, 1841. Machine-maker.

AGRICULTURAL ENGINEERING.

So many months have elapsed since we published any paper, or even casual remark, upon this most interesting subject, that those who are more immediately interested may suppose that we have neglected and forgotten both them and it. Such, however, is by no means the case, for we only waited most anxiously to see the Drainage Bill pass through the Houses of Parliament, as that would have given us at least an epitome of parliamentary opinions upon that particular branch of the art. We suppose, however, that this bill, in company with many embryo and formless things which appeared to be in progress, has probably gone to the tomb of all the Capulets with the defunct parliament, and for this reason we put a short note upon record, to show that we still look upon a skilful improvement of the land as one of the most important subjects that can occupy the attention either of the legislature or of the country.

We choose the present occasion for publishing this note, in consequence of what took place after the dinner of the meeting of the Royal Agricultural Society of England, on the 22nd or 23rd of July, no matter which. This society was got up under the auspices of Lord Althorp, now Earl Spencer, and the number of agriculturists present is stated to have been 3,000, assembled in a pavilion erected expressly for their accommodation. They were from many parts of the country, and consisted of men of all shades of politics, from the outrageous Tory down to the equally outrageous Radical, although among agriculturists the last are exceedingly few, as the humbler classes of the agricultural population are too quiescent in their dulness for being carried away by the most thundermouthed demagogue. They are a little sensitive about their bread and bacon, but care little or nothing for anything else; and therefore, the words of the most cogent and effective reasoner pass as effectlessly over them as the ripple of the sea passes over an earth-fast mass of granite.

The reports which have reached us of the proceedings, or rather the speechifyings of this great agricultural gathering, have filled us with joy; but this joy is like the overflowings of some rivers, which leave pestilence when they ebb away. What we rejoice at, is the absence of all politics, and the highly respectable figure which the landed proprietors of England cut, when freed from that abomination, that arch pest of British society, from the highest class down to the lowest. It was quite pleasing to find Earl Spencer and Lord Stanley concurring in opinion upon the great object on which they had met,—the earl in the strength of that consistency, as an independent nobleman, from which he has never swerved, and the lord reverting, in a momentary way, to those liberal principles which are hereditary in him, and which he should not merely hold in his own person, but in virtue of the long line of a most illustrious ancestry. It is truly lamentable to think that Lord Stanley has deviated from the path of his ancestors; and this stings the deeper, when we see how glorious a successor nature has fitted him for being to even the most illustrious of them; and we are quite certain that when Lord Stanley bethought himself of his own backsliding as compared with the sturdy consistency of Earl Spencer, the contrast must have been gall and wormwood to him. It is not, however, so much in the absence of politics we rejoice, as in the figure which these noblemen and the rest of the meeting displayed in this political absence. No one who heard the speeches of that day could doubt for a moment the high qualifications which these noblemen and other high personages have for performing the duties of that high station in which they are placed, and thus being equally worthy in themselves, and useful to their country. The speech of Lord Stanley, considered in itself, was quite a *chef d'œuvre*; and, although we do not agree with him on all the points of detail, we admit the force and effect of his general principles. As he stated them on the occasion alluded to, they were perfectly sound, and such as would have done honour to any speaker. One feels much pleasure in listening to this, and being convinced by such listening that no one class of society is better qualified for discharging the duties of its office than the class of land-owners. It is equally true and apparent that no class has more important duties to perform; and therefore, none is more honoured by the discharge of those duties, or more culpable in the neglect of them; and that very many of our land-owners, whether men of title or not, are thus culpable, cannot be denied; and as little can it be denied that there is one great cause of failure which turns them aside from the path of duty. This cause of failure is politics, not the peculiar politics of any one sect, but politics in the general sense of the term, as something that stands as a barrier between a man and the performance of his duty. This unfortunate bias destroys the very ground-work of usefulness on the part of our landed proprietors, and throws them from being the most valuable and efficient class of persons, to being the most useless and insignificant. If they knew no better, and could conduct themselves no better, they would have a sort of excuse, though a humiliating one; but, as matters stand, they are quite inexcusable, being disgraced by politics of their own free will, or at least without any justifiable or even nameable cause. Thus their guilt is more deep and demoralizing than if it were impressed upon them by any necessary cause; for nobody is compelled to be a politician, and if he becomes so, and especially if he is a renegade in politics, he is sunk to the lowest depth to which a man can descend. But demeriting and degrading as this part of the matter is, it is only a small fraction of the whole. We quarrel with no man for being a politician, how deeply soever he may sink in the slough of that most unholy art. But we do take an exception, and that a heavy one, to the price at which this political degradation is purchased, the more especially because that price is really paid out of the public pocket. It is not with what a politician does that we quarrel, it is with what he pays for doing it. This price is, as we have said, levied upon the public, and upon them only, and the weight of it is far greater than would at first sight be imagined. Politicians, like all other men, have certain duties to their country which they ought to perform. Those duties are onerous, and if they are not performed, and that to the full measure of their importance, the parties are guilty, and that in a very high degree; for their duties are not only onerous, but they are more so than those of any other class in the nation. The obligation upon any man to do a public duty, is always important in proportion to the value of that in which he deals. Now the land is the grand staple commodity of the land-owner, and the land is by far the most valuable article in which any man can deal, or which he can have. The owners and conductors of other works have various duties, arising out of the varying degrees of value of the commodities in which they deal. Some of these are absolutely necessary to the well-being of society, and others are of no substantial nature whatsoever; but the staple commodity of which the land-owner has charge, rises in importance above all others. One set of producers labour to clothe us, another

to ornament us, and so on through a long variety. Some of these commodities are more necessary to our well-being, and others are less so; but the produce of the land, and consequently the land itself, is of paramount importance to every one. Comfortable clothing, commodious dwellings, and tasteful and appropriate ornaments, are all valuable in their way, and to their class; but any of them may be dispensed with as occasion requires. Every body must eat, however; and, therefore, the produce of the land is a portion to all, which cannot possibly be dispensed with.

This truth is so self-evident that no question upon it was raised by any of the noblemen or gentlemen at the meeting. But the onus upon landlords to increase the produce of the land by every means in their power, was not stated nor even alluded to as a general proposition. Lord Stanley, who was the chief and almost the only speaker upon the occasion, did allude to various curative means; but these, though generally sound in principle, did not go to the root of the matter. They were merely partial, and went to little points of improvement, such as the drainage of land, and other minor matters which are palpable to every body. Now, the Speaker-general of the grand Agricultural Society of England, ought have gone a little more deeply into the matter than this. He ought to have pointed out the general means of increasing the produce of the land, and the obligations under which landlords lie to carry these means into effective execution. Even in the slight view which he did take, there was one very general error. His Lordship fell into the vulgar mistake of attributing the superiority of Scotch farming-produce to the higher tone of character which exists among the people of Scotland, than among those of the sister kingdoms. This may be true, although the truth of it is not demonstrated; and, granting its truth as a general principle, it is certainly much exaggerated. But, even though it were true to the letter, it is not the cause of the superiority of farming and farm produce in that part of the island. It might not have suited Lord Stanley's present line of conduct; but under whatever restraint that nobleman might be as to the statement of it, the truth of the case remains the same:—the Scotch farmers are free from certain restraints, both of the landlord and of the church, which press heavily upon the English farmer, and paralyze his very desire of improvement. That the land should be put in the best position possible for obtaining the full amount of its value, is a truth which no one will deny, and as little can it be denied that much science is required in order to do this with the proper effect. Nor can it be denied that in this respect the farmers of England are sadly wanting. They do not bring the requisite degree of science to bear upon their farms, and especially on their improvements; and therefore they are incompetent to discharge their duty as it ought to be discharged. We have again and again alluded to the necessity of introducing what we, for want of a more appropriate name, have called Agricultural Engineering, that is, the simple application of scientific principles to the management, and especially to the improvement of farms. Until this is done, and done upon obviously sound principles, farming will never be what it ought to be; the land will be badly managed; and the produce of it will be much less than it ought, and consequently human food will be both scarce and dear. But here the important question arises,—who is to bring this science to bear, and thus effect these improvements? The operative farmer is the man who understands it best, and he is therefore the fittest man for doing it. But does he do it? We must say no, not as it ought to be done. And why does he neglect that, the performance of which seems to be his first interest? The answer to this question is a very plain and simple one,—the landlord will not allow him; for if the operative farmer so improves his land as that it yields a more valuable crop, the landlord steps in and takes the lion's share of the advantage, and after this, the parson demands and gets no inconsiderable portion of the remainder. Under such a state of things it is impossible, or at all events it is not likely, that the farmer should do much toward improving the soil and produce of his farm. Generally speaking, he is not capable of doing this in a pecuniary point of view; and though he were so capable, the circumstances in which he is placed destroy all desire of doing it. How rich soever a man may be, he has no disposition to spend money from which he reaps no advantage; therefore the farmer does not improve his land, either by scientific culture or careful management, because the land-owner will not allow him.

It is very usual to associate the parson with the landlord in this burden which is imposed on the farmer; but, if he is a burden at all, the weight of it is greatly exaggerated. Tithes, simply as a payment, are very little if at all felt by the farmers of the present day, because the time when they were imposed is so distant, that the tenant has his rent in a great measure adjusted to them; and as the rent of land is always the very highest that the tenant can bear, if the tithes were taken from the parson they would be paid to the landlord, which, in money paid by the tenant, would come exactly to the same thing. What makes the burden of tithes appear to press so heavily upon the English farmer, is the fact of their being a separate charge, and palpable to the payer as such; whereas, if included in the rent, they would not be separately visible, and therefore they would not be felt. One cause of the superiority of the Scotch farmer over the English lies in the Scotch tithes being hidden in the rent; and by this means one source of grumbling, if of nothing else, is taken away. The old English method of paying tithe in kind is the most palpable, and therefore the very worst mode in which that impost can be levied. The commutation will do a little good, though probably not nearly so much as the advocates of that measure supposed; for though the tithe will be concealed by the commutation, it will still be known as a payment in supplement to the rent of the land, though not so offensive, because not so palpable, as a payment in kind. It is not in the tithes, however, or even in the rent, that the evil lies, which presses so heavily upon the English farmer; it is in the mode in which rent is adjusted, or in the general relation between landlord and tenant. It is in this that the grand superiority of the Scotch farmer over the English one consists, and it is this which paralyzes the efforts of the English farmer, and prevents him from improving his land in the way it ought to be improved. If the farmer had nothing to contend against but his mere rent, or even his tithes, he would stand in the same position as any other man who makes bargains; for the rent would be nothing but the price of the commodity that he purchased, and the tithes would answer to a custom house or excise duty. In ordinary business the last of these is not felt, because prices soon adjust themselves to them; and the rent of land would follow the same law as the price of all other marketable commodities; and no man would take a farm without a well-grounded prospect of making a profit of it. This is the real ground of superiority in Scotch farming, and by necessary consequence of the conditions of Scotch farms. Lord Stanley must be aware of this, though the expression of it did not exactly

suit him or the principles which he now holds,—when a Liberal, his Lordship would perhaps have been less squeamish on the point. The evil which presses upon the English farmer, and prevents him from improving his land as he could do, and otherwise would do, is of a political nature; and the land remains unimproved, and the farmer is made a beggar, in order that the land-owner may use him as a political tool. The analysis of the whole case would be a long and laborious matter; but it will be sufficient to state that the gravamen of it lies in the farmer having no lease. Unless the farmer holds lands of some corporation, where leases are generally renewable, and the renewal again and again comes almost as matter of course, he is a tenant at will; and if he does not vote at elections, and conduct himself in all matters, according to the will of his landlord, the refusal so to vote is tantamount to a notice to quit. In every respect this is demoralizing in the very highest degree, and it will utterly prevent the farmer from improving his land by scientific or other means, though, in a pecuniary point of view, he is quite capable of making the improvements. But, besides this, there is another, and a very serious evil: as the farmer has no encouragement to love his land, he does not study the means whereby it might be improved; and the very same bad management on the part of the landlord which prevents the farmer from improving, destroys the desire of improving his farm, and also of acquiring knowledge upon any one subject. Thus the conduct of the landlord has a tendency to make the farmer an ignoramus and a fool, as well as a slave and a beggar. Now we would ask, if a farmer so circumstanced can by possibility improve his farm—or anything else; and it is not too much to say, that the answer to every branch of this question cannot fail in being a direct negative.

We trust that we have now demonstrated, and that but too plainly, that the farmer cannot have the will or the power of improving either his farm, or the implements and modes used in the improvement of the farm. That he is placed in this situation, is the fault of the landowner; and, therefore, the said landowner is in equity bound to effect those improvements, which he will not permit in the tenant. If, therefore, the landowner shall complain of the backward state of farming, he, in reality, complains against himself; and complains for the most cruel of all reasons,—that of preventing the farmer from doing good to himself, and at the same time to the landlord. These are facts which cannot be gainsaid; and make out a most cruelly oppressive case of the landlord against the tenant, and a most absurd one against himself. Under the present system, the state of things cannot be made better; and therefore, the whole system of the law of landlord and tenant ought to be altered, and the political abuse of it prevented by the most stringent means. The landowner might remove the greater part of the evil, and a few landlords do it; but, while it remains an optional matter on their part, landlords who do justice to their tenants will form but a small fraction of the number. Yet, until this is done, it is useless to speak of the improvement of farms, either by superior implements, or superior modes of culture. To the country, this is very grievous; for there is no question, were it not for the landlords, and for this conduct on their part, a very large addition might be made to the produce of the land, as much, indeed, as would render us almost or altogether independent of foreigners, in the first necessaries of life. We speak of an alteration of the corn laws: but these laws are a mere drop in the bucket, as compared with the law of landlord and tenant, the alteration of which would be the greatest, and should be the first, agricultural improvement.

HOLBORN BRIDGE VIADUCT.

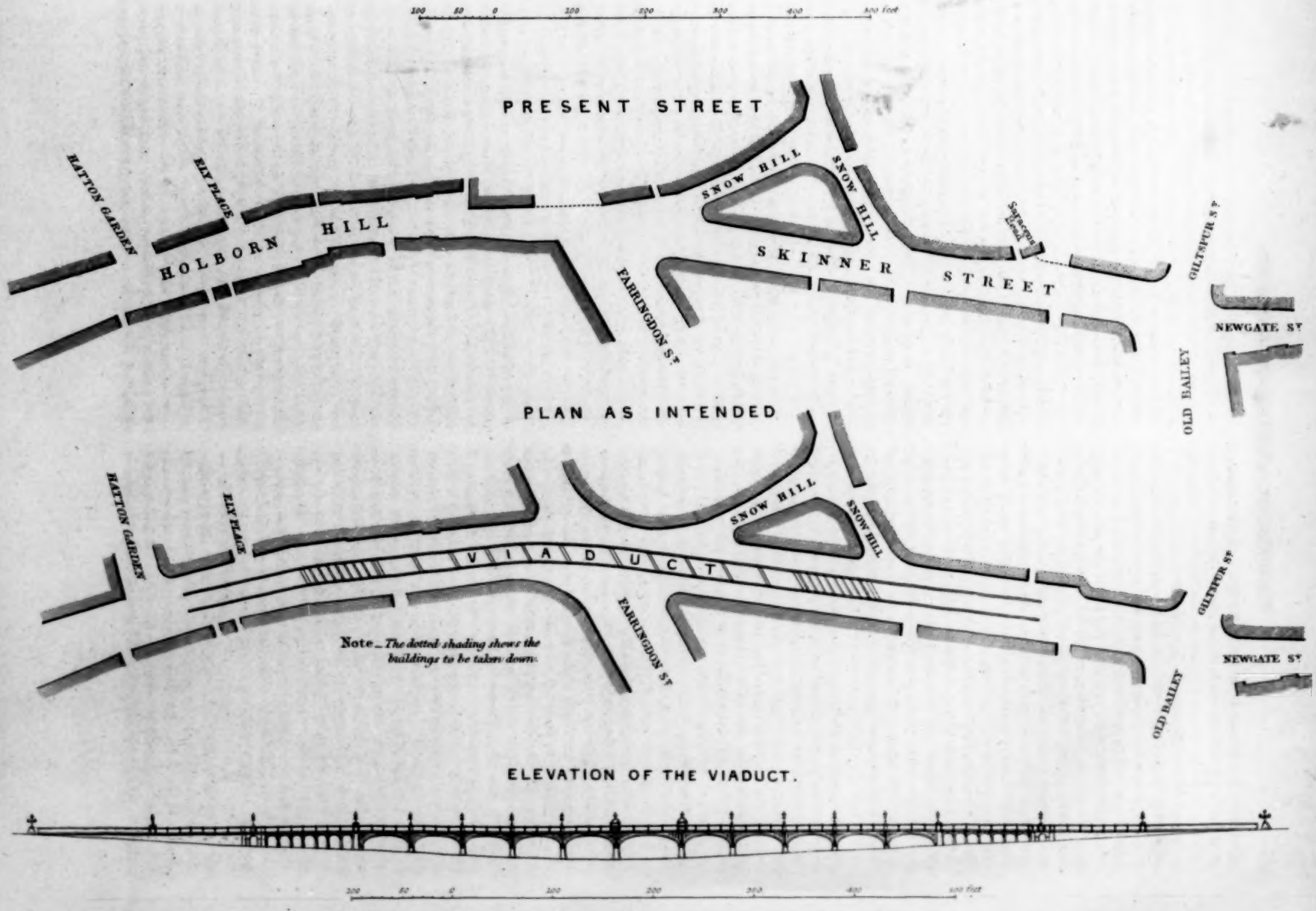
SUBJECT OF THE PLATE.

In our preceding Number, we made some general remarks on the very dangerous nature of this portion of the great central thoroughfare between the West End of the metropolis and the East, and we briefly adverted to the immense destruction of horses which the highly dangerous and disgraceful state of this part of the street occasions. Further, we threw out some hints as to what appeared to us the cheapest and best method of executing the projected viaduct,—the best, and indeed the only engineer-like project which has been brought forward with a view of obviating the evils of this passage at the smallest sacrifice of the existing good. We shall, in all probability, take a future opportunity of entering into the estimate of the evil, with some minuteness of detail; but in the meantime we confine ourselves to the proposed schemes, of the best and most recent of which we give the ground-plan and the elevation, which show what will be the effect upon the streets, and the grand crossing, when Farringdon Street shall be extended northward in the direction of Clerkenwell Green.

We waive, for the present, all comparison between an iron bridge of large arches, on the suspension principle, and one of comparatively small arches upon the same principle as ordinary bridges of pressure, whether constructed of iron or of any other material. We put the opinions of engineers and architects to one side, and doubt whether the public is yet prepared to be satisfied with a suspension bridge where there is a great constant traffic; and, upon this principle, it is probable that, if what we suggested in our number for August were to be brought forward as the structure to be adopted, a great and general public outcry would be raised against it. We are ourselves quite satisfied that the apparent weakness of a suspension bridge is its real strength, but as we have no interest further than that of serving the public, we bow even to prejudice, until time shall wear it away. Therefore, it only remains for us to compare the viaduct, of which we give a representation, with the other schemes which have been advanced for the real or supposed improvement of this dangerous part of the street. We take it for granted that all who have any interest in the matter, or who simply notice what is going on, must feel convinced of the urgent necessity of doing something in the way of improvement here; and strangers are perfectly astonished that nothing has hitherto been done. The schemes, including that which we greatly approve, and warmly recommend,—at least in principle, are three in number; and to them we shall briefly advert in their order. In doing this, however, we must beg leave to quote, from our former statements, the grand point which ought never to be lost sight of in street improvements, or indeed in any improvements whatsoever:—the good which it is intended to accomplish ought to be obtained at the least possible sacrifice of that which at present exists, and at no sacrifice whatever in all cases where it is practicable. Requesting the reader to bear this in mind, as one of the canons according to which the projects must be tried, we now turn to the projects themselves.

First, a plan has been propounded for filling up the hollow between Holborn Hill and Skinner Street; and so leading the road along a mound elevated above the present surface. Now, in the judgment of reason, and to any one who reflects but for a moment, this proposal must appear quite absurd. If the hollow across which the street passes were to be filled up to the level of Holborn and

HOLBORN BRIDGE VIADUCT.



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Engraved by I. Dower.

the top of Skinner Street, the cost would be immense, the consequences would be most destructive, and the whole neighbourhood would be reduced to a fraction even of that value which it possesses in its present condition. The mere fact of filling up so large a space, and giving it such consistency as that a street could be formed on the top of it, would cost far more money than a commodious and secure viaduct; and this expense would be still farther, and that very greatly, increased, by the alterations of the streets and the sewerage; and taking up and relaying the water and gas pipes.

This would be the case even if nothing were paid attention to save the levelling, in whole or in part, of the hollow along the line from west to east; and, besides the enormous expense of the mound itself, and the filth of bringing a million loads of mud into the centre of the city, a most violent opposition would be raised, and that very justly, by the owners of all the property along the sides of the mound; for such property would not only be rendered valueless, but would be much worse than empty space. All the cellars, and many of the shops, would be buried up; and as there are no back entrances, this submoundal portion would be absolutely unfit for those purposes which have brought sinks of pollution into those parts of the building on the south bridge of Edinburgh, which are below the line of the street, and have their entrances and their glimmerings of light at the back.

The bridges and mounds of Edinburgh, delightful as they might have been rendered from their situations, are so bungled in their execution, and so abominable in their applications, that they may serve as warnings for similar works in all other places. It must, however, be borne in mind, that those works were constructed in the palmy and perfumed days, when dirt was dominant in the modern Athens; and that now, even there, a few of the more refined spirits who have seen England, cry shame at the forty-two performers, whose postern concert makes the arches of the North bridge to ring again to the strains of its truly Edinburghian melody, while

> "Donec, iterumque, iterumque,
> ——— vere omnes,
> Et sic turba horrida mustrat."

The present lower walls on Holborn bridge would not be able to resist the lateral pressure of the mountain of mud, so that the houses, if such a plan were adopted, would have to be built up to the top of the mound, with useless walls as massive as those of a baronial castle; and this at an expense—a useless expense—which neither should nor would be borne.

But even this is but a small fraction of the mischief that would result from a mound; for the hills on the Holborn line could only be got rid of by hills raised to the same height in Farringdon Street, in the new street northwards, and in Snow Hill; and the cure attempted by such hills would be far worse than the present disease,—as a considerable portion of the north and south line would be destroyed, and Farringdon Street would require the same expense in the buildings, and be subjected to the same deterioration, as Holborn Hill. The fact is, that this mound would have to be laid down like a great star fish, with its points extending up many streets and lanes, and each of the principal branches of it would cost more than a viaduct, while the whole of it would be a perfect abomination. It has, we believe, been proposed to construct the mound along only the southern half of Holborn Hill, and thus leave the northern half for business; but still the passage eastward would be cut off by the cross mound to the north, and by this means, the business character of the place would be destroyed.

Even now there is a good deal of cross traffic from Farringdon Street into the east and west line; and when the street is extended northwards, the traffic will greatly increase; and this will become one of the greatest business crossings in the city. Common sense conspires with the general advantage of all concerned, in demonstrating that the roads adjoining the pavements, and also the shops and houses at this crossing, should be left as nearly in their present condition as possible, and this along all the principal streets; and if the two great thoroughfares were to cross each other on the inner section of two mounds, it would be dangerous in a far higher degree than even Holborn Hill is at present; and constant apprehension, and frequent accidents, would be purchased at an enormous expense —an expense which not even London could bear, seeing that nothing but farther loss and injury could be the future result. We know not with whom this project originated; and we think it is as well that the name of the originator is in the same thick darkness of oblivion, which shrouded his wits when he propounded so monstrous an absurdity.

Secondly, it has been proposed to avoid the danger and difficulty of this part of the street, instead of removing them. According to this plan, Holborn Hill and Skinner Street are supposed to be left in precisely the same situation, with respect to inconvenience and danger, only the trade is to be taken away, in whole or in part, and the value of an important locality is thereby to be almost wholly destroyed. The proposal is, or rather was—for we hope no one thinks of it now—to accomplish this by means of a new line of street, twisting southward at the upper part of the Old Bailey, passing through the crowded buildings to Farringdon Street; crossing that upon arches, and then passing through the equally crowded buildings, until it ultimately turned into Holborn. How the portions to the east and west of Farringdon Street were to be raised and supported, we do not know; and it would be useless to inquire, for the whole project resolves itself into the construction of a pretty long line of street, at the greatest possible expense, and of the least possible use when constructed. This shifting of the line southward would spoil the general direction; and all the property from the Holborn end to the Old Bailey end of the old line, much of which is very valuable, notwithstanding the present state of the hills, would be quite destroyed—or, if this were not the case, the altered line would serve for no other purpose than as an evidence of the folly of its projectors. For local trade, both Skinner Street and Holborn Hill are highly valuable as they are now; and when the northern part of the cross thoroughfare is opened, their value will be greatly increased. It is, therefore, not desirable to interfere with them, any farther than by the removal of those irregularities and projections, which removal would give uniformity, space, and air to the streets, and thus improve the property, and lead to more splendid buildings and superior trade. Of this project we need say little more: its expense would be enormous—greater, perhaps, than that of the mounds, and its usefulness would be less than nothing.

Thirdly. We now come to the viaduct, which is by far the cheapest method, and one which involves the destruction of no property, and the diversion of no trade from the place where it has been established. After the other two, we know not whether most to admire the good sense and high practical talent which suggested

the viaduct, or the real service which it will be to the locality. As we have said, it will destroy nothing, and remove nothing—except that of which the removal will be a local improvement; and, like all other skilful applications of engineering and architectural talent, it will facilitate subsequent improvements, instead of standing in the way of them. These are most important qualities; and, if the work is carried into execution, which we hope it will soon be, it will stand very forward, if not the foremost, among the metropolitan improvements. We know not whether the idea originated with Mr. John Alex. Galloway and Mr. Higgins, though we are inclined to think that it did; but, with whomsoever it originated, it is evidence of abilities of the most practically valuable kind.

As we stated in our last Number, the total length will be about twelve hundred feet, and the road along the viaduct will be nearly level with the continuation of the streets. In our former notice, however, we, by some means or other, got hold of an imperfect elevation, and thus did not do full justice to the superstructure, which will be less heavy, and admit of far more air and light than we then stated. It is proposed that this viaduct shall have the roadway formed of cast iron, in wide arches supported upon piers of masonry. In this respect it will bear some resemblance to the *Pont y Cyssylte* aqueduct—only that is surmounted by a trough of water, and this will have a roadway. The height is also trifling in comparison, which admits of more slender piers, and arches of greater span.

In the plate, three views are given: first, the plan of the streets as they at present exist; secondly, the improved streets with the viaduct; and thirdly, the elevation of the viaduct, upon a rather larger scale than the plans. We need not go into any detailed account of those representations, because they themselves will tell their own story better than it could be told in words.

It is intended that the viaduct shall be for carriages and horsemen only, as by this means the trade of the shops will not be interfered with, and, indeed, the resort of people to them will be rendered more easy as well as more safe than it is at present. It is not the trade of the immediate locality which occasions the annoyance and danger on these hills, but the omnibusses and other vehicles of transfer, which merely disturb the locality without giving it any compensation in return. It is also those vehicles which suffer most by casualties to their horses, although in this way they are not the only sufferers. This suffering will naturally make them prefer the line of the viaduct, and the halfpenny which it is proposed to levy upon each carriage will be an exceedingly low rate of insurance against the present damage. But carriages of all descriptions will have their option of either passing along the viaduct or by either side of it, as may be most suitable to them, The cross traffic from Farringdon Street will naturally take the line south of the viaduct, and that of the extension northward when opened, the line to the north; and at the deepest part the wide arches will afford numerous and easy cross passages, so that the locality will be rendered safe, and the local trade will be conducted in the easiest manner possible.

The intention is to erect the work by a company, under the sanction of an Act of Parliament, to the passing of which there can be no reasonable objection; but a clause will be inserted, empowering the City at any time to purchase the work, upon paying what has been expended on it. Thus the improvement will be secured to the public in the mean time, and the City will not be ultimately deprived of any part of its privileges.

By viewing the work in conjunction with the prospect of a great north and south thoroughfare crossing a great eastern and western, which is the light wherein it ought to be viewed, it will at once be seen that the viaduct possesses advantages which could not be afforded by any other scheme. We have already shown that each of the other proposals would, after incurring enormous expense, render the state of things worse than it is at present; and if the present state were to be continued it would become far worse when the cross thoroughfare was opened. The number of carriages and parties passing along each thoroughfare would be so great and so continual, that this crossing would be the most dangerous one in London, and accidents would be numerous; but the viaduct, by removing the mere transit traffic, which is always the most rapid, would almost, if not altogether, remove the danger of accidents. In addition to this the local trade would, as we have noticed, become less interrupted and safer, by which means it could not fail in being increased; and it will be seen by the elevation that the structure will be so light and open, where it requires to be highest, as not in any sensible degree to darken the shops, or even the cellars.

Such is a brief outline of this work, as proposed by those with whom the idea originated. We are fully convinced, and so must every unprejudiced party be, that the execution of it will be a good, unalloyed by evil, and, therefore, we cannot even fancy a ground of objection that any person can have to it, without involving himself with the charge which is none of the most agreeable: it eminently deserves success, and we hope the success will be speedy, so that the public may not be much longer without a work in which their comfort and safety are so deeply involved. We shall return to the subject as we see cause.

RURAL RESIDENCES: RICAUTI—BROWN.

INSTEAD of reviewing them separately, we shall, for convenience sake, put them together, and make some comments upon two works, professedly belonging to the same class, but the very antipodes to each other in character. Of Mr. Ricauti's "Rustic Architecture," we reported favourably, though briefly, in speaking of some of the earlier numbers, on their first appearance; nor does the publication, now that it is completed, belie or discredit the opinion we then formed as to its merits. The author of "Domestic Architecture," on the contrary, has to be announced to our readers, and by no less imposing a title than that of "Professor Brown,"—for it is by the style of "Professor of Architecture" that he has thought fit to designate himself. Egregiously silly, therefore, must he be himself—or egregiously silly must he take other people to be, if he imagines that they are to be duped by such an impudent mountebank trick—one that is as vulgar as it is unprofessional. Even if not morally wrong, it is so thoroughly low and contemptible, that no respectable man would stoop to it, any more than he would think of walking through the streets with a fool's cap on his head, in order to obtain notoriety. For our part, we would as lieve affix the letters Q.U.A.C.K. to our name, which, by the bye, might very properly be entailed upon some who now drag after them those of F.S.A., and half the alphabet besides.

Still we allow that Brown is a very great "Professor" in his way—albeit it is not the very best of ways,—since his title page, by far too lengthy, and too much in the style of an advertisement, for us

to quote, professes and promises most largely. Unluckily, performance lags sadly behind profession; while the Professor himself is hindmost of all. When we first saw such an unusual quantity of letter-press, we anticipated a good deal of fresh matter on the subject; instead of which, there is scarcely anything at all to the purpose. The whole is little better than a mere *omnium gatherum* —a rigmarole farrago, a medley, a hotchpotch composed of the most far-fetched and irrelevant ingredients, and plentifully garnished with scraps of poetry! Perhaps we are incorrect in making use of the epithet "far-fetched," since a great portion of it has been taken ready-made, and has been hashed up so frequently before, as to be now quite stale. That much is most preposterously absurd, because utterly foreign from the purpose, or pretended purpose of the book, will not for a moment be doubted, when we say that the "Origin of Architecture" is lugged in, merely in order to inform us oracularly, that little positive can now be known in regard to it. Then, again, we have some tedious and stale remarks on Egyptian, Phœnician, Grecian, and other styles, which are just as much in place in a publication, whose title leads one to expect that its letter-press will treat of domestic architecture at the present day, and what immediately bears upon it,—as an account of the Phœnician and other languages would be in an English grammar. We could have excused some of this impertinence, had such matter been introduced in order to point out or suggest what might be borrowed by us from such sources, and turned to account, if not exactly in our domestic architecture, in buildings of a different class—perhaps in railroad stations, and other constructions of that description. But nothing of the kind is even attempted.

In fact, there is no architectural remark, even in regard to examples of "Domestic Architecture," both in this and in other countries, which belong nearly to our time; no examination or appreciation of their respective merits and defects. Though it will scarcely be believed, nothing is said of the great changes—in some respects improvements—introduced into our style of house-building, by the Adams; nothing of the influence of Wyatt, and of what may be called his school. The whole of this part of the subject, which, if properly treated, might have been rendered highly valuable and interesting, is hurried over in the most slovenly manner, and is terribly meagre and *jejune*; adding not a single iota to what may be picked up, ready made, out of almost any cyclopædia. On the other hand, the dissertations on geology, and other matters of that sort, might very well have been spared, since no one will either look for, or care to have them, in a work intitled Domestic Architecture. That a knowledge of geology is useful to the architect, we do not deny; but so, also, is that of geometry, carpentry, the different kinds of timber, and various other things, going back even as far as reading, writing, and arithmetic.

Beneath all this pomposity and parade in order to give the work something of a scientific character, there is a great deal of real ignorance, it being evident enough, that Professor Brown himself has not the slightest idea of what is wanted in a work of the kind, or what will be serviceable to those who order it on the faith of its title, and who will now be egregiously disappointed. While endeavouring, as it would seem, to adapt his book to the taste of almost every body, by cramming a little of almost every thing into it, he has, in fact, adapted it to the wants of nobody. To some it must appear remarkably superficial and defective: to others, encumbered with a weighty stuff, which they neither understand nor can have occasion to know. The chief purchasers are likely to be country builders and mechanics; and what care such persons about the pleasantness and salubrity, or the contrary, of the spot where the house they may be employed upon is erected. Therefore, the Professor might very well have dispensed with the assistance of the "celebrated member of the College of Physicians," who has been engaged to prescribe as to choice of situation, in regard to air, water, &c.

No doubt some few country gentlemen may buy the book, with the hope of finding some clever or tasteful ideas in it. And, if they can make anything out of Professor Brown's designs, they must be cleverer than "country gentlemen" are usually reputed to be; yet, should they borrow anything at all from them, they must at the same time be more stupid and ignorant than the veriest clodhoppers. As to styles, indeed, there is choice enough, for the Professor deals in all styles, though it is evident that, so far from understanding, he has not even the slightest notion of any one of them. Were it possible for us to entertain such idea, we should say that his examples of Pompeian, Venetian, Florentine, Flemish, French, and other styles, were intended only as so many burlesque architectural parodies and travesties,—as ironical specimens, after the fashion of those given in the satirical "Hints to Churchwardens." As such they might pass for exceedingly droll, funny, and clever caricatures of the kind; but they are about the very vilest rubbish, in every other respect, we ever met with. If Hell is paved with good *designs* as it is said to be with good intentions, why then there is no danger of Professor Brown's designs being sent there, although, in themselves, they are truly damnable, notwithstanding the *virtue* of their publisher.

We almost take shame to ourselves, for having put Mr. Ricauti into such bad company as Professor Brown; however, we do not think that his taste is at all likely to be contaminated by that of the *soi-disant* and self-elected Professor.* For him, we have no apprehensions whatever of that sort. On the contrary, we have seldom met with any publication of the kind, which fulfils more satisfactorily the promise made by its title, for all the designs are of highly "picturesque and pleasing appearance"—beyond all comparison more so than those which have from time to time been given in various publications, some of which have been calculated to bring the term "Picturesque" itself into disrepute. Though so calling themselves, many designs, even by persons from whom we should have expected something of a superior kind, have been altogether the reverse of picturesque, remarkable for nothing so much as their formal stiffness and insipidity, and their equally unarchitectural and unpictorial character, both as to composition and detail. Among them we must place Gandy's "Cottages," which work, incredible as it may seem, was actually dedicated to Thomas Hope; and also a similar work, of about the same calibre as to taste, by no less eminent a person than Sir John Soane. Several of the designs in Goodwin's "Domestic Architecture" are not very much better—sufficiently fanciful and odd, but, nevertheless, not particularly picturesque. Indeed, the majority of the picturesque fancies which have hitherto been published, are what no artist would introduce into a painting or drawing, if he could possibly help it; or, if compelled to do so, would find it requisite to disguise or screen the building as much possible. Widely different is the case with Mr. Ricauti's: many of them seem as if expresly intended as studies

* Our Brown is neither the only Professor of the kind, nor the only one of the name; for, *mirabile dictu*, passing through the City the other day, we beheld a board on which was inscribed in large letters, "Professor Brown," and beneath, "Hair Cut in the first style of Fashion!"

for painters and artists—excellent in character—rustic, rural—yet without any affectation of simplicity—without overdone rudeness on the one hand, or finical ornament on the other—full of variety, but sober withal, and free from aught *outré* and merely whimsical—at least if we except the introduction of rough timber work into the mullions and transoms of windows, whose forms are derived from a more finished style. Yet this is but half their merit, for their plans and internal arrangements are well studied, and also well described by sections and plates of detail, both of which are hardly less novel than desirable illustrations in works of this kind, having hitherto been omitted as if altogether superfluous, and as if no instructions beyond those afforded by the plan were required for the inside of a house. In short, Mr. Ricauti has acquitted himself so well in his *debut*, that we hope shortly to meet with him again, and that he will, as he conditionally promises in his introduction, "proceed with another series of designs, under the title of Cottage Architecture;" and should he do so, we would recommend that the letter-press should be printed in the usual upright, instead of the oblong form adopted in the present work.

As to Professor Brown, we shall keep our eye upon him, and also upon his portrait, which is to be given, by way of *bonne bouche*, we suppose, in his last number.

ON THE MOMENTUM PROPOSED BY MR. JOSIAH PARKES, AS A MEASURE OF THE MECHANICAL EFFECT OF LOCOMOTIVE ENGINES.

BY THE COUNT DE PAMBOUR.

In the *Transactions of the Institution of Civil Engineers*, vol. iii., Mr. J. Parkes has published a paper *On Steam Boilers and Steam Engines*, in which his object is to propose, as a new measure of the mechanical effect of locomotive engines, what he calls the *momentum* produced by the engine, that is to say, the product of the mass, in tons, of the engine, tender, and train, multiplied into its velocity, in feet per second. According to him, this momentum being measured at one velocity, for a given engine, the effect of the same engine, at any other velocity, will be immediately deduced from it, by a single proportion (page 130), without troubling one's head about the inclination of the road, the friction of the waggons or engine, the counter-pressure due to the blast-pipe, the resistance of the air, or, in fact, any of the resistances really encountered by the engines.

To establish this new idea, Mr. Parkes's first step is to represent as altogether faulty and impossible every calculation or experiment made by others, to take account of the divers resistances offered to the motion of the engines. With this view he enters into a long and malevolent discussion on the experiments of our *Treatise on Locomotive Engines*, and on all the experiments on the same subject published by divers engineers; and to demonstrate the difficulties, insurmountable, in his opinion (p. 124, 125), and the uncertainty attending such researches, he indicates divers verifications which, as he says, these experiments ought to satisfy, and which they do not satisfy. As Mr. Parkes gives on the subject a great number of arithmetical calculations, the errors of which are protected against detection by the heap of figures presented, we shall at first enter, with some detail, into the examination of his pretended verifications, and afterwards shall proceed to discuss the value of the new measure proposed by him to represent the mechanical effect of locomotive engines.

On seeing the fundamental errors on which his reasonings and his calculations are grounded, the inaccuracy of his criticisms, and of the results at which he has arrived, will be at once recognized.

1st. Mr. Parkes proposes to calculate the pressure at which the steam was necessarily expended in the cylinder of each engine submitted to experiment, in order afterwards to compare that pressure with the pressure resulting from the totality of the divers determinations of resistances exerted against the piston, according to the *Treatise on Locomotive Engines*. With this view, he seeks, from the velocity of the engine, the number of cylinders-full of steam which were expended per minute. Comparing the volume thus obtained to the volume of water vaporized in the boiler, he concludes the *relative* volume of the steam during its passage into the cylinder; and finally, recurring to the table of the relative volumes of steam under different pressures, contained in our *Theory of the Steam Engine*, he concludes the pressure which the steam must necessarily have had (p. 83, &c.). This is conformable to our theory, developed in the *Treatise on Locomotive Engines*, which, in fact, Mr. Parkes entirely adopts. But to perform this calculation, Mr. Parkes takes the *average* velocity of the whole trip from Liverpool to Manchester (p. 85, at table viii. col. 10; table xiii. col. 9; table xvi. col. 2); and from that velocity he pretends to deduce the *mean pressure* of the steam in the cylinder, during the same trip. Now it will be easy to prove by an example that this mode of calculation is altogether faulty.

Suppose, in effect, the engine *Atlas* to have travelled a distance of 30 miles in an hour and a half, vaporizing 60 cubic feet of water per hour. As the wheel of the engine is 5 feet in diameter, or 15·71 feet in circumference, as there are two double cylinders full of steam expended at every turn of the wheel, and as the capacity of those two double cylinders, including the filling up of the steam-ways, amounts to 4·398 cubic feet, it follows that the volume of the steam which passes into the cylinders per mile performed, or per distance of 5280 feet, is $\frac{5280}{15{\cdot}71} \times 4{\cdot}398 = 1478$ cubic feet.

This premised, when Mr. Parkes refers to the average velocity of the whole trip, to value the pressure in the cylinder, as that velocity is 20 miles per hour, and as the vaporisation at the same time is 60 cubic feet of water per hour, he finds for the ratio of the volume of the steam expended to the volume of water, $\frac{1478 \times 20}{60} = 492{\cdot}7$. Consequently, recurring to the table of the relative volume of steam under different pressures, he obtains for the corresponding total or absolute pressure 56·66 lbs. per square inch; and, deducting the atmospheric pressure, he obtains for the effective pressure 41·95 lbs. per square inch.

But to show that this mode of calculating, from the average velocity, can only lead to error, let us suppose that, by reason of the divers inclinations of the portion of the railway, the first 15 miles have been traversed in half an hour, and the other 15 miles in an hour, which still makes 30 miles in an hour and a half; as 30 cubic feet of water will have been vaporized in the first half hour, or during the passage of the first 15 miles, and 60 cubic feet of water during the next hour, or in the passage of the last 15 miles, it is plain that the volume of the steam will have been respectively in each of those times, $\frac{1478 \times 15}{30} = 739$, first, and afterwards $\frac{1478 \times 15}{60} =$

369·5. Whence results, according to the table, that the effective pressure of the steam will have been successively 21·62 and 62·95 lbs. per square inch.

Thus, during the first half hour the effective pressure will have been 21·62 lbs; during the second half hour it will have been 62·95 lbs., and during the third again 62·95 lbs. Consequently, taking account of the time during which the pressure has had those respective values, it is plain that the mean effective pressure in the cylinder, will have been $\frac{21{\cdot}62 \times 62{\cdot}95 \times 62{\cdot}95}{3} = 49{\cdot}17$ lbs. per square inch, and not 41·95 lbs. per square inch, as given in Mr. Parkes's calculation; which, by the way, supposes all the portions of the trip to have been performed in equal times. In this case, therefore, which has nothing in it but what is very ordinary, there would be an error of 7·22 lbs. per square inch out of 41·95; that is, an error of more than $\frac{1}{6}$ on the effective pressure of the steam. It is evident that the calculation, such as Mr. Parkes makes it, is exact only for portions of road composed of one inclination, or travelled with *uniform* velocity. and that it cannot apply to the total passage of a line composed of different inclinations. For further elucidations on this head we refer to chap. xvii. relative to inclined planes, of our *Treatise on Locomotive Engines* (2nd edition), and to chap. xii. of the same work, in which all the experiments considered by Mr. Parkes are calculated.

2nd. We have just shown a first error which Mr. Parkes introduces, as a fundamental basis, in his calculation of the pressure of the steam in the cylinder. But he does not stop there. In the table of experiments on the vaporisation of the engines (p. 175 of the *Treatise on Locomotive Engines*, first edition, and p. 253 of the second edition), we have given the average velocity of the engine during each trip; and that velocity is obtained simply by dividing the whole distance performed by the time employed in performing it, as is seen in the table in question. It would be natural then for Mr. Parkes, who, as has been said above, is satisfied with average velocities in his calculations, to take those which are given in the table; but instead of that, he augments almost all the velocities about $\frac{1}{3}$. Thus, for instance, the *Vulcan*, which travelled 29·5 miles in 1 hour 17 minutes, and whose average velocity in consequence was stated to be 22·99 miles per hour, had, according to him, a velocity of 26·90 miles per hour. The velocity of the *Vesta* rises from 27·23 to 31·60 miles per hour, and so of the others (table viii. col. 10; table xiii. col. 9; table xvi. col. 2). The critic falls into this new error because, in the *Treatise on Locomotive Engines* (page 324 of the first edition, and p. 311 of the second), in speaking of fuel, it is said that, when the engines ascend without help the inclined planes of the Liverpool and Manchester Railway, the surplus of work thence resulting for them, equals, on an average, the conveying of their load to $\frac{1}{9}$ more of distance; and Mr. Parkes logically concludes from this that the *velocity* of the engine must be by so much increased (p. 86, 112). So that if an engine perform 1 mile in 4 minutes, ascending a plane inclined $\frac{1}{90}$, which renders nearly five-fold the work of the engine; it would follow, from this calculation, that the velocity would not have been 15 miles per hour, but $15 \times 5 = 75$ miles per hour, since the quantity of work done would have been five-fold! Mr. Parkes's error proceeds from his having applied to the *velocity* a correction which refers only to the *work* done, and, as a consequence, to the corresponding consumption of *fuel*.

But on examining what effect results from this substitution of the imagined velocity of Mr. Parkes for the observed velocity, it will be remarked, that whenever an engine is obliged to ascend without help one of the inclined planes of the Liverpool and Manchester Railway, it exerts in that moment, as we have said, an effort about five times as great as upon a level, and draws its load less rapidly. One would then deem it allowable to conclude, that the average pressure of the steam in the cylinder must be augmented, since, during a certain portion of the trip, the effort required is greater, and that the *useful* effect per unit of time must be diminished, since during the same time the useful load is drawn at less velocity. But no! Mr. Parkes's calculation, by augmenting then the apparent velocity of the engine, demonstrates that in this case the average pressure in the cylinder becomes on the contrary much *less*, and that the useful effect becomes much *greater*; so that the error committed, produces itself here in two opposite ways.

With these elements Mr. Parkes establishes the *whole* of his calculations and tables, to the very end of his paper (table viii. col. 10; table ix. col. 19; table xiii. col. 9; table xiv. col. 2; table xvi. col. 2); and as, to augment the evil, this pretended correction is made only on one portion of the experiments, namely, those in which the engines were not helped up the inclined planes, without being made in the other cases, there results an inexplicable confusion in all the calculations. Thus, it happens that Mr. Parkes's determinations of the volume and pressure of the steam consumed by the engines (table ix. col. 26 & 29), the horse power produced per cubic foot of water vaporized, or the quantity of water employed to produce one horse power (table x. col. 44, 45, 49, &c.), the momentum generated per second (table xiii. col. 11, 12; table xiv. col. 9, 10, 11), and all the consequences thence derived, are in every way erroneous.

To show, by a particular example, the fallacy of the results to which Mr. Parkes has been led by this wholesale and faulty way of calculating, we need only refer to the two experiments of *Fury*, which he extracts from the *Treatise on Locomotive Engines*. He pronounces, "with certainty," these experiments to be erroneous, as exhibiting an engine performing more work at 23 than at 21¼ miles per hour, in the ratio of 24 to 19. Now, to arrive at this conclusion, Mr. Parkes first takes the velocity of the engine, not at 18·63 and 19·67 miles per hour, as given from actual observation, (p. 175 of the first edition, and p. 253 and 392 of the second edition of our work on locomotive-engines,) but at 21·79 and 23 miles per hour respectively (table xiii. col. 3). Secondly, in comparing the work done in the two trips, he does not take into account that the first of the two trips has been made from Manchester to Liverpool, and the second on the contrary from Liverpool to Manchester. But there is a general rise of the ground from Manchester towards Liverpool, and, from that circumstance, the gravity opposes more resistance in that direction than in the contrary one. Thus it happens that a less train carried on the line from Manchester to Liverpool, may require from the engine a greater quantity of labour than a heavier train carried in the opposite way. In effect, by referring to page 501 and 504 of the second edition of our work on locomotives, it will be found that in the two experiments under consideration, the work done by the *Fury*, in carrying the two loads of 43·8 and 51·16 tons, besides tender, from Manchester and from Liverpool respectively, to the other end of the line, was

43·8 tons, from Manchester to Liverpool,
gravity included, to . . 1964 tons to 1 mile.
51·16 tons, from Liverpool to Manchester,
gravity included, to . . 1837 tons to 1 mile.

We see, therefore, that when we take account, as we ought to do, and as Mr. Parkes has not done, of the surplus of labour caused by gravity, the work required of the engine is in reality more in the first case than in the second, although the load is less. Consequently, the engine ought to have accomplished the second trip in less time, or with a greater average velocity than the first, which, in fact, it did, and which had led Mr. Parkes to pronounce with so much "certainty" the experiments to be erroneous.

This example shows that the calculation of Mr. Parkes, with an erroneously averaged and exaggerated velocity, in which, moreover, he omits the gravity on the inclined planes, the resistance of the air, the friction of the engine, and all the other resistances really opposed to the motion, leads him to a *very inaccurate* measure of the work performed by those engines; and this refers to the whole of the results obtained, (table ix. col. 29—32; table x. col. 41—50; table xiii. col. 11 and 12; table xiv. col 9, 10, and 11; table xvi. &c.), and also to his comparison of the locomotive and stationary engines, which we shall notice further on.

3rd. After having calculated *very exactly*, as we have shown, the pressure of the steam in the cylinder, Mr. Parkes compares the result which he has obtained with the total pressure on the piston, resulting from the partial resistances suffered by the engine, according to the *Treatise on Locomotive Engines;* and as, in the first edition of that work, the author had confined himself to mentioning the pressure against the piston due to the action of the blast-pipe, without making any experimental research on the subject, Mr. Parkes, without noticing the results presented since on that head, in the *Theory of the Steam Engine* (p. 161), takes the difference between the two results as necessarily expressing the pressure due to the blast-pipe (p. 82, 83), and he demonstrates the inaccuracy of it. Here we perfectly agree with him; for, besides the errors already pointed out in his research of the pressure of the steam in the cylinder, everything variable that can occur in the different data of resistance, now passes to the account of the pressure due to the blast-pipe, and must necessarily come to falsify the calculation of it. Thus, for instance, in the experiment, a great deal of water was lost by priming, and there resulted an apparent vaporization greater than the true one. A part of the difference between the calculated and the observed pressure was therefore to be attributed to that cause, though it could not be accurately measured; but, by the calculation of Mr. Parkes, it all passes to the account of the pressure due to the blast-pipe. Similarly, the resistance of the air, then imperfectly computed in the total resistance for an average velocity of 12 miles per hour, is found, in all cases of greater velocity, to augment considerably the pressure due to the blast-pipe, and, on the contrary to diminish it in all cases of less velocity. A favourable or an unfavourable wind necessarily produces similar effects. Thus, circumstances, combined with the fundamental errors already introduced in the calculation, raise or lower that pressure to all imaginable degrees (p. 87, 88, 90, and 91); and it will readily be imagined that such a determination cannot be exact.

4th. Mr. Parkes has observed, in the experiments of the *Treatise on Locomotive Engines*, and particularly in two of them, made with the engine *Leeds*, and quoted in the *Theory of the Steam Engine*, that the useful effects produced by the same quantity of water vaporized varies according to different circumstances; and he is amazed at it; for, as he affirms, the useful effects produced by the same quantity of water vaporized, in the same time, and under the same pressure in the boiler, ought in all cases to be indentical (p. 104, 119). But this again is merely an error of the critic; for if we suppose a locomotive engine drawing a heavy load at a small velocity, since it is only at a small velocity that the engine has to overcome its friction, as well as the atmospheric pressure against the piston, and, above all, the resistance of the air against the train, it follows that, out of the quantity of total work executed, there will be but a trifling portion lost in overcoming those resistances; but if, on the contrary, we suppose the same engine performing precisely the same quantity of *total* work, but drawing a light load at a great velocity, it is obvious that a much greater part of the work done will be absorbed in moving at that velocity, the resistance which represents the friction of the engine, as well as the atmospheric pressure against the piston, and in overcoming the resistance of the air, which increases as the square of the velocity; and consequently there will remain a much smaller portion of it applied to the producing of the useful effect. Hence, in the two cases considered, the useful effects produced by the same quantity of water vaporized, so far from being identical, will, on the contrary, be very different from each other. Mr. Parkes may, besides, satisfy himself on this point, by perusing the *Theory of the Steam Engine*, in which he will find numerous examples of steam engines, in which the useful effect of 1 cubic foot of water varies in very wide limits, according to the velocity of the motion or the load imposed on the engine; and he will find it explained theoretically in chap. xii. of the *Treatise on Locomotive Engines*, 2nd edition, or in chap. iii. art. 2, of the *Theory of the Steam Engine*. Thus Mr. Parkes's reasoning errs again by the basis itself.

5th. But there is another principle to which Mr. Parkes would subject all the observations of vaporization of locomotive engines. He remarks that, in the two experiments above cited, the total resistance opposed to the motion of the piston is different in the two cases. Consequently, says he, the quantities of water vaporized by the engine in the same time must be in proportion to the pressures in the cylinder, and the experiments must satisfy this condition, (pages 99, 100, &c.) Upon this point he is merciless.

To establish this new principle, Mr. Parkes recurs to the *Treatise on Locomotive Engines* itself. He quotes a passage in which, supposing the same engine travelling the same distance with two different loads, the author says positively that the distance travelled being the same in both cases, the number of turns of the wheel, and consequently the number of strokes of the piston given by the engine, that is to say, the number of cylinders full of steam, or, finally, the total volume of steam expended, will also be the same in both cases; whence results that the same volume will successively have been filled with two steams at different pressures, or, in other words, at different densities; and consequently the quantities of water which have served to form those steams will be in proportion to their respective pressures (p. 310—312 of first edition). Thus, this passage establishes very distinctly that the quantities of water vaporized, *for the same distance*, are in proportion to the pressures of the steam in the cylinder. But what does Mr. Parkes conclude from this? Why, that the quantities of water vaporized *in the same time* are in proportion to the pressures in the cylinder. Now, it happens to be quite the contrary; for, if we suppose, by way of example, the two pressures to be in the ratio of 2 to 1, the volumes of water vaporized for the same distance will also be as 2 to 1; but if the time employed in performing the

distance in question be two hours in the first case and one hour in the second, it is plainly the quantities of water vaporized in two hours and in one hour respectively, which will be one to the other in the ratio of 2 to 1, so that the vaporization per hour, or *in the same time*, will be equal instead of being in the ratio of the pressures. Thus it is clear again that Mr. Parkes's principle rests but on a new error, which consists in making a confusion between the vaporization for the same distance and the vaporization for the same time.

6th. A final observation of Mr. Parkes (p. 89, 90, and 98), is this,—that in some experiments, the locomotive engines produced, for the same quantity of water vaporized, a greater useful effect than several stationary high-pressure engines, or even than several condensing steam-engines, and he considers this as a proof of the inaccuracy of those observations; for, says he, the locomotive engine having to contend with the pressure arising from the blast-pipe, which the high-pressure engines have not, and also with the atmospheric pressure, neither of which resistances the condensing engines have to contend with, it is incontestable that they cannot even produce equal effects, much less superior ones (p. 104). But this reasoning is as unfounded as those we have already noticed; for, since the useful effect of steam engines, for the same vaporization, diminishes as the velocity of their motion increases, which has been explained above, and is found developed, either in chap. xii. art. 2, of the *Treatise on Locomotive Engines*, or in chap. iii. art. 2, § 1, of the *Theory of the Steam Engine*, it is easy to conceive that a locomotive working, for instance, at its *maximum* useful effect, that is to say, with its maximum load, and consequently at a very small velocity, at which the pressure due to the blast-pipe and the resistance of the air are nearly null, can produce a useful effect greater, nay, much greater, than a stationary high-pressure engine, working on the contrary with a light load and a great velocity. The same inferiority of effect, relative to a locomotive, may also occur in a condensing engine, because an engine of that system, working, for instance, at 16 lbs. per square inch in the cylinder, and condensing the steam to 4lbs. per square inch *under the piston*, where the pressure is always greater than in the condenser, loses, by that fact alone, a quarter of the power that it applies; whereas, a locomotive, working at 5 atmospheres in the cylinder, and at a very small velocity, which renders almost null the pressure due to the blast-pipe, suffers, by the opposition of the atmospheric pressure, a loss equal to but $\frac{1}{5}$ of its total power. Hence, definitively, in the latter engine, the counter-pressure against the piston destroys a smaller portion of the total power applied, and consequently, even without noticing the difference of friction of the two engines, or entering into any other consideration relative to the velocity, it is conceivable that the useful effect of the locomotive may be found the greater.

But if a more complete calculation be desired, it will be easy to furnish it; for the relative volume of the steam at 16 lbs. pressure per square inch, being 1672 times that of water, it is plain that if s represents the number of cubic feet of water vaporized per minute in the boiler, and if a represent the area of the cylinder expressed in square feeet, $1672\,s$ will be the volume of the steam generated per minute, whence results that $\frac{1672\,s}{a}$ will be the velocity, in feet, per minute, assumed by the piston of the engine working at that pressure. Moreover, the *effective* pressure of the steam, or the load which the piston can support, is $16-4=12$ lbs. per square inch; which gives $12\times144\,a$ for the total resistance, in pounds, supported by the piston. Thus, in the condensing engine, the effect produced by the number s of cubic feet of water, expressed in pounds raised 1 foot per minute, is $1672\times12\times144\times s=2{,}889{,}216\,s$. Calculating in the same manner the case of the locomotive engine, we find that the effect it produces for the same vaporization s, working at the total pressure of 75 lbs. per square inch, or at the effective pressure of 60 lbs. per square inch, and expressed in pounds raised one foot per minute, is $881\times60\times144\,s=3{,}291{,}840\,s$. Therefore, finally, its useful effect per cubic foot of water vaporized, will exceed that of the condensing engine, and this again is a circumstance, examples of which will be found in the *Theory of the Steam Engine*.

Thus, this new peremptory condition which the experiments ought to satisfy, is as unfounded as the former ones; and, in fact, Mr. Parkes contradicts it himself a little further on (p. 157, 158), so that we might have referred his first argument to the second for refutation. But, besides the foregoing considerations, it must be borne in mind that the velocities employed by Mr. Parkes for locomotive engines, being nearly all considerably augmented, as has been explained above, he must necessarily arrive (p. 85, 87, 89, 92, and tables x. xiii. xiv. xvi.) at exaggerated results, for the effects which he supposes to have been produced by those engines; and therefore his comparison between locomotive and stationary engines is altogether founded upon false calculations.

It is remarkable, finally, that in applying the preceding considerations to all the experiments published on locomotives by different engineers, namely, Messrs. R. Stephenson, N. Wood, E. Woods, and Dr. Lardner (p. 102, 117, 118, 159), Mr. Parkes finds that the conditions to which he proposes to subject those experiments are not verified in them. Such a result ought to have put him on his guard against the validity of his own arguments; but the want of knowledge of the principles of mechanics, and of habit in mathematical reasoning (the author tells us that he is more accustomed to handle the hammer than the pen), causes him to heap errors on errors, combining and complicating them unawares, till he arrives at a point where he does not produce one single result that is not erroneous.

There is a matter of surprise in the numberless errors contained in the paper of Mr. Parkes, and of which, for the sake of brevity, we have only noticed the principal ones, reserving the rest for another opportunity, if necessary. But on inquiring what was the end he had proposed to himself,—what was to be the definitive consequence of his labour, one is yet much more surprised.

His object is to propose a new measure of the effect of locomotive engines; and this *new* measure is what he calls the "*momentum*" generated, that is to say, "the product of the mass, in tons, of the engine, tender, and train, multiplied into its velocity in feet per second." This standard is to "represent the negative mechanical effect produced per second by each engine," (p. 128.)

Now, the true mechanical effect produced, includes the whole of the resistances and frictions really overcome by the engines—that is to say, the friction of the carriages, the friction of the engine, the gravity of the mass on the different inclines traversed, the atmospheric pressure, the pressure due to the blast-pipe, the resistance of the air, &c.; and in multiplying the sum of all these resistances by the velocity of the motion, we shall have the mechanical effect produced. But if, among all those divers resistances, we take account *only* of the friction of the carriages and engine,

omitting all the rest, and if we suppose, for an instant, that friction to be 6lbs. per ton, as well for the engine as for any other carriage, we shall have the effect produced, in multiplying the weight of the train, tender, and engine included, first by 6lbs., and afterwards by the velocity of the motion. Now it is evident that, in calculating thus, we shall have exactly the same numbers given by the computation of Mr. Parkes, excepting that all of them shall be multiplied by 6. Therefore, the new measure proposed comes merely to this, that the effect of the engines will be calculated by the friction of the carriage only, and that of the engine considered as a mere waggon, and the results divided by 6.

But, as this pretended "standard" comprehends only a portion of the resistances really overcome; as it does not include the gravity of the train, which may, according to circumstances, offer a resistance exceedingly great, or null, or even act in favour of the motion; as it does not include the counter-pressure due to the blast pipe, which varies according to the velocity, the rate of vaporization, and the size of the blast-pipe; as it does not include the total friction of the engine, but only the friction of its wheels, as a simple waggon; as above all, it does not include the resistance of the air, which, from experiments of which Mr. Parkes is "utterly ignorant," (p. 124,) varies according to the bulk of the train and the square of the velocity, so that the quantity neglected, on that account, in the calculation, may at times be quite trifling, and at other times exceed the *momentum* of Mr. Parkes itself; as in fact this pretended *new* measure is nothing more or less than the common *useful effect* of the engine, as given in many works, and especially in our *Theory of the Steam Engine* and *Treatise on Locomotive Engines*, with these differences only, that, in the calculation of Mr. Parkes, it includes also the weight of the engine, and that it is erroneously computed, inasmuch as, in multiplying the weight of the train in tons by the velocity, the calculation is made as if the whole weight were raised up in the air by the engine, instead of being dragged or rolled along the rails; as finally, this pretended standard, instead of being constant, varies with the velocity, just as well as what Mr. Parkes calls the *commercial* and *useful* effects, so that it is not more easy to know the one than the other, and that the rule of Mr. Parkes, which we are going to quote, refers to the one just as well as to the others; for all these reasons, then, we see that the aforesaid measure is not new, that it does not measure the mechanical effect of the engines, and, finally, that it is nothing more or less than the common useful effect (weight of engine included,) calculated in considering the whole train raised up in the air, and the engine as a mere waggon.

After having thus founded upon *reasoning* the accuracy of his new measure of the mechanical effect of the engines, Mr. Parkes proceeds to show "the powers of this method of analysis" (p. 131). Collecting all the erroneous results which he has obtained in his tables, and admitting, then, as accurate, the experiments of the *Treatise on Locomotive Engines*, which he thought of demonstrating false before, Mr. Parkes forms a table, in which he sets in view, on one side, the vaporization effected by the engine, and on the other side the useful effect produced, giving it only the name of *momentum*, when it includes the weight of the engine besides that of the waggons. Then, comparing the vaporization to the effect produced, and taking an average, not upon his own experiments, *since he has made none*, but upon all the experiments which he has collected from the divers works published on the subject, he presents (p. 130), as the result of his labours, the following conclusions, which he proposes to substitute in place of every other kind of research on locomotive engines.

When the velocity of a locomotive engine is augmented in the proportion of 15·2 to 1, the vaporization necessary to produce the same effects varies in the following proportions:

To produce the same *momentum* (the same useful effect, weight of waggons and engine included), in the proportion of 1·42 to 1, or in a proportion something less than that of the velocities: to produce the same *commercial* gross effect, (the same useful effect, including the weight of the waggons), in the proportion of 2·43 to 1, or nearly as the square of the velocities; to produce the same *useful* effect (the same useful effect, net weight), in the proportion of 3·11 to 1, nearly as the cubes of the velocities.

This is the definitive result which Mr. Parkes has attained, and the help of which seems to him to render it needless henceforward to seek to determine either the friction of the waggons, or that of the engines, or the resistance of the air, or anything, in fact, that may influence the effects produced; researches which appear to him to offer insurmountable difficulties. Possessed of the *wholesale* result of Mr. Parkes, nothing more will be needed. Does any one wish, for instance, to know what load a given engine will draw at 25 miles per hour, on a given inclination?—to know what velocity it will assume with a load of 60 tons?—to know what is the maximum of useful effect that it is capable of producing?—to know what proportions must be given to it, in order to obtain desired effects? Why, having recourse to Mr. Parkes's result, the solution of all these questions is self-evident!

It is evident, on the contrary, that Mr. Parkes's rule, even were it exact instead of being founded on erroneous calculations, could lead to but one thing, namely, to find the useful effect produced by an engine, at the velocity of 30 miles per hour, when the same effect, under quite *similar* circumstances, is known at the velocity of 20 miles per hour. But, even then, making use of so rough an approximation, in which all is thrown in the lump,—friction of the waggon, friction of the engine, resistance of the air, resistance owing to the blast-pipe, &c.,—the result could never be depended upon. Assuredly, calculations like these do not tend to the progress of science; they would rather lead it back to its first rudiments. For this reason, we persist in our belief that the only means of calculating locomotive engines, is to endeavour to determine, as exactly as possible, each of the resistances which oppose their motion, and by taking account of the value of each of these forces in the calculation, we may in every case attain a valuation really founded in principle, of the effects of every kind that are to be expected from them.

PAMBOUR.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Q., "NOT in the corner," asks us several questions respecting this grand peripatetic conglomerate, which revolves in the remote parts of the British islands, much in the same way that Saturn and his moons do in the dark and distal twilight of solar space. Some of these questions answer themselves; some we could answer; others we do not choose to answer, and others, again, no man can answer —not even the Association itself, which we suspect has no more

consciousness of its own use to society, than a mill-stone has of its own motion.

"What is the Association occupied in doing?" This suggests a doggrel parody on the well-known lines by Richard Porson:

> At Glasgow, we got tubs of tea
> From the most learned—*fiddle de dee.*
> After, at Plymouth, we got *some*
> From the less learned—*fiddle de dum.*

"What science does the Association advance?" Look into their papers, and they will seem to tell you what the members seem to try: look to their cutting up the Association into sections to receive pecuniary rewards, as if one were carving a goose so that the joints might eat, instead of being eaten, and you will arrive at the pith and marrow of the matter. The real science which the Association labours to advance, above all others, is that of reciprocal praise and reciprocating pudding—the latter being levied upon the different towns in succession, in the shape of an alms to wandering pilgrims; and so pat is this name, that we think a most appropriate title for their history would be, "The new Pilgrim's Progress, from the Valley of the Shadow of Oblivion, onwards to the desired and desirable Paradise of Praise and Pudding." In plain English, the members seek for opportunities of praising each other before the assembled and wondering people of the several towns which they visit; and the fact of their having to do this is a tacit admission of the thick darkness in which, otherwise, they, or the majority of them, would be constrained to abide.

Then for the pudding: there is an annual payment, though we believe a commutable one, by each member, and as much in supplement as can be raised from the people of those towns, which they honour with their displays of trenchering and toping. Then the hospitality of the said people is so warmly praised, that one suspects gratis dinners of being among the chief stimulants of the philosophical bumps.

Then for the "sharing of the swag:" each member who is capable of making an entry, if he does not get his share, has a little doled out to him now and then, with oceans of praise to wash it down. But there are certain chosen ones—chosen for what we cannot tell—that receive constant and copious messes from the board. Foremost among these, we may place Sir David Brewster, whom the Association have enabled, if he were so inclined, to comfort his inner man, with the essence of more malt than "Willie brewed;" and somewhere near him, but in the rear, comes Doctor Digestion Prout, who, from the breaking down of the Bridgewater Treatises, to the last meeting of the Association at Plymouth, has been fagging at an explanation of the working of the human stomach, in converting tripe or turtle into ideas or actions. The Doctor is a very able man, but he has mounted this hobby, and it has grown so high under his straddle, that it appears he cannot get off the saddle. This has given rise to the following doggrel lines:

> TO UNASPIRING TRENCHER-MEN.
>
> If you your gustive powers should doubt,
> Pray, read the books of Doctor Prout:
> They'll teach you how to eat a whole ox,
> Despite blue devils, gripes, and cholics.

But we have no time to go further into the list: suffice it to say, that there is an air of great partiality—an appearance of retarding, instead of advancing science, in the sectional rewards, and the parties receiving them. The natural consequence of this is, that the public and the more spirited men of science are getting tired of the Association. At Plymouth, the attendances were poor, and the papers and speechifications still poorer. This, we are told, caused some "grumbling i' the gizzard," and occasioned not a little cudgelling of brains as to how the Association might regain its notoriety. We presume that the reporter is guilty of the cacology; but it is attributed to Col. Sykes, a very able man, that he recommended the admission of children to the benefits of the Association, as "*Ladies' Tickets.*" This was most kind and considerate on the part of the Colonel; and bearing in mind where and by whom the notion was started, "*having children*" will be considered in all times coming "*the Ticket* for the ladies,"—to which we are constrained to add our Amen—and Amen.

THAMES HAVEN DOCK AND RAILWAY.

Our attention has been drawn to this project, by the publication of a pamphlet on "its Advantages," written by Mr. Amsinck, one of the chief promoters of this valuable undertaking. The chief difficulty which has arisen in the completion of this work, seems to be its connexion with the Eastern Counties line. Had its originators boldly proposed an integral line, there is little doubt that the public would have seen at once the advantages to be gained by taking the steamers, and such of the river traffic as requires quick dispatch, out of the river, and availing itself of such saving in time as a dock situated at the entrance of the river, and connected with the metropolis by means of a railway, evidently would afford over (steam) conveyance along the river, subject as it is to the influence of adverse winds and tides, and still more impeded by the dangerously crowded state of the Pool. Hence, a dock always accessible would prove highly useful, as offering a commodious and easy embarking and landing place to all passengers,—a comfort which would, we doubt not, be fully appreciated after the present dangerous method of landing and embarking by means of small boats, when the tide will not permit of the vessel approaching the wharf.

The quantity of live and slaughtered cattle now brought by steam, would reach the market so much earlier—consequently so much fresher and more wholesome. Fish would be more extensively supplied, to the benefit of both rich and poor, and equally to the remuneration of the fishermen. In short, *all* articles of a perishable nature would be supplied in greater quantities; the price of coal would be lessened, affording the poorer classes many benefits now debarred them; and the danger attendant on navigating the river utterly avoided. Thus, of all undertakings, public or private, we know of *none* which alike offers so many advantages to the poor as well as the rich; which would produce so many beneficially important changes, or tend so much to the comfort of the metropolis, as the undertaking now before us—the Thames Haven Dock and Railway. In confidence that the many advantages offered cannot be too highly eulogised, we have thus spoken; and we hope and trust that the public will view the plan in the same light, and give it the support required, and immediately carry through the work so as to effect all these happy changes, alike beneficial to the public as to the proprietors.

We have neither time nor space to enter farther into the subject this month, but we shall resume it in our next, and enter into a minute investigation of a project which ought to be well understood

and duly appreciated by the public; and for the drawing of which this is the proper season, as so many pleasure parties are subject to all the delays, annoyances, and dangers, of the river navigation.

PROFESSIONAL PREJUDICES.

"My copper lamps, at any rate,
For being true antique, I bought;
And wisely melted down my plate,
On modern models to be wrought:
These trifles I alike pursue,
Because they're old—because they're new."

So sung the most powerful bard of one of the most debased ages of British history, when the agitating swell of civil war and republican, or at all events Protectoral government, had ebbed away; and a profligate monarch had come to the throne, and brought to the country the licentiousness and bad taste of foreign courts, by which all that portion of public spirit and public feeling which was truly English, was completely destroyed—at least for the time. This love of novelty and antiquity often produces very strong prejudices, which are as inveterate now as they were in the days of Charles the Second; and, though they are not nearly so general now as they were then, they appear all the more ridiculous upon that account.

We shall mention two of these merely as specimens of the way in which they exist, and operate among professionals.

In the first place, these men, whether surveyors, engineers, or architects, have a most over-weening love for lithography: and, in all cases where their drawings require to be multiplied, they have recourse to this ugly and clumsy art. The pretence for this is the cheapness of lithography as compared with copper-plate engraving: but the difference in price is a mere trifle, and only as a drop in the bucket compared with other expences: ordinary copper-plates can be produced at about one-third more than lithographic drawings on stone; and as the printing from copperplates is considerably cheaper, the difference in cost is reduced almost to nothing. Then, the beauty of the engraving, and the correctness and nicety with which minute details can be made out, and the perfect similarity of all the impressions, give the copper-plate vast advantage over the lithographic drawing. Besides this, the plate can be preserved, and more impressions obtained at any future time, at no more cost than that of the paper and printing, whereas lithographic stones generally have to be re-drawn, if future impressions become necessary. For heavy, coarse work, where only a few copies are required, lithography will do; but even then, the copies are dearer than if they were obtained from copper. When the impressions are many and the work fine, and especially when there are ornaments, lithography is bad, and ought not to be employed, because the impression which it gives of the subject, is imperfect, meagre and vulgar; and the finer details must be supplied by the imagination of the observer,—whereas, in a copper-plate, even a tolerably good one, the details may be made absolutely microscopic. If the work is to be an expensive one, and one of public ornament, which ought always to be the case in great works, the advantage of engraving is immense, and the cost of it not worth consideration; and when copies of the plans and sections of a public work have to be circulated, they should invariably be printed from copper-plates, because that is the only means of doing justice to the professional man and to the public; and for such purposes, outline engravings are always preferable to such as are shaded, because the shading is mere garnish, and actually hides that which ought to be the principal, and indeed the only subject of the representation.

When indeed one considers the subject attentively, one is led to believe that the very object of having recourse to these lithographic daubs, is the hiding of the main subject, and introducing a picture in its stead, in which the eye is attracted by spots and blotches of colour, which prevent the mind from concentrating itself upon that which ought to be presented to it without any confusion of other subjects. In plans which are given in for competition, lithography should never be employed; and there is a similar objection to coloured drawings, even though executed by first-rate artists. In all such, the architect is concealed from view, and the painter alone presents himself to the observer. Perhaps this is intended: and the architect, conscious of his own inability, veils himself in the shade of the painter. This must indeed be the case; for if it were not for the concealment and cheat of the picture, we should not have both town and country encumbered with so many architectural abortions as now encumber both, and are daily on the increase. It is in the pictures that the parties concerned are deceived; and the deceit will never be got rid of, until all competition plans are ordered to be mere outlines, and copper-plate representations of these, reduced if necessary, are circulated among the public, or the parties concerned. To have this done would operate a very substantial reform—a reform much needed in our public architecture.

In the second place, it appears that a very considerable number of our architects and engineers have an equally overweening disposition to move in the rut which has been made by their predecessors, and an equally great hostility to improvements, whether made by other engineers, or by parties not of the profession. It is not easy to account for this prejudice, seeing that it exists among men whose professions are most liberal; and who ought, therefore, to have less prejudice than any other men, whatsoever the proper emulation among such men ought to be who shall produce the best work, at the least possible expense; but we very much fear that, as long as architects and engineers are paid by a per-centage on the cost of what they do, the majority of them will endeavour to make the cost as great as possible. We have a striking instance of this in the hostility which many of the profession not only feel, but openly avow, to chain bridges upon the principle invented by Mr. Dredge. To that gentleman, as a man, they can have no hostility; and as his suspension bridges are demonstrably superior to any others, it must be against the improvement—against the great saving to the public—that the hostility is directed. The public of London, from which that of every other part of the country takes its principal tone and opinions, have already an opportunity of judging of Mr. Dredge's works upon a small scale, in the two bridges across the ornamental water in Regent's Park; and, in the same locality, they will soon have an opportunity of judging of others on a much greater scale. The Commissioners of Woods have engaged with Mr. Dredge to construct three more bridges,—one of 150 feet span, across the broad part of the ornamental water; and two of 100 feet each, across the canal. The important point to state, with regard to these two bridges, is their great cheapness, as compared with chain bridges that have been erected, or are proposed to be erected, by engineers. Mr. Dredge's 150-feet bridge will

cost only £4 per foot in length; and a projected foot bridge across the Thames, opposite Hungerford pier, will, according to the estimates which have been published, though we are not sure that these are authenticated by Mr. Brunel, junior, the engineer, cost £140 per foot—or about thirty-seven and a half times the cost of Mr. Dredge's bridge; and be it remembered that both are foot bridges, and that, though elephants were to pass along it, the cost would not be greatly increased. It is farther understood, that a bridge projected by the same engineer across the Avon, at Clifton, would cost still more per foot; and, in addition to this, both of these bridges would have a tendency to be damaged or broken by their own weight, which is not the case with structures formed on Mr. Dredge's principle. We have analysed that principle with great care, and we must admit the soundness of it, and its superiority to every other. This is all we have to say in the mean time, but we shall take an early opportunity of adverting to the Regent's Park bridges, and illustrate them by engravings.

EXPORTATION OF MACHINES.

(*Continued from page* 142.)

I HAVE no object in drawing parallels or making comparisons, merely because they are favourable to my countrymen; but the subject warrants these remarks. They prove that our superiority in arts and manufactures is based upon positive and peculiar advantages, and that our commercial prosperity does not depend upon the monopoly of a few machines, and the uncertain action of a bad law.

Every improvement in machinery that economizes hand labour, operates twofold in favour of the English manufacturer, by substituting steam power for human exertion. This will be at once apparent, if we suppose—an extreme case—that hand labour is entirely superseded by steam power. Then it is evident, that as we have coals at an average of one hundred and fifty per cent. cheaper, and machinery forty per cent. cheaper, than our rivals across the water, all the advantages would be on our side. It follows then clearly, that the more machinery is improved, the less we have to fear the pretended cheap labour of the continent. The SELF-ACTOR is, in this respect, a most valuable invention. It costs dearer, requires much less labour, and more steam—all of them conditions unfavourable to the foreign manufacturer, to whom labour is cheap, but capital is scarce, and coals are dear.

The high price of machinery, is an immense disadvantage abroad; nor would the free exportation of it from this country diminish the price in any degree. As regards France and Belgium, it is highly probable that the abolition of the law will be the signal for those Governments to augment the import duty on machinery, both as a protection to their iron masters and machine makers, and because restrictive measures against articles of British manufacture are in the spirit, and most agreeable to the feelings exhibited, on all possible occasions, by the former; and how far the latter is guided by a wiser policy or kinder intention, may be known by referring to the augmented duties imposed upon goods coming from England. Nay, a project for augmenting the import duties on iron and machinery has just been submitted to the Chamber of Representatives, by the Minister of Finance, at Brussels.

Machinery going to France, including import duties, packages, and all other expenses, will have to support an additional cost of 35 per cent. If we include shafts, drums, and gearing, the extra cost will be at least 45 per cent.; that is, that a mill, which in Manchester costs fifty thousand pounds, would, in St. Quentin or Paris, cost seventy-two thousand five hundred pounds. In Austria, and other parts of Germany, the cost of mills is considerably higher in proportion. Mr. J. C. Symonds, in his Report on the Hand-loom Weaver's Commission, states, from the best authority, that a cotton mill of twenty-four thousand spindles, which in Manchester costs twenty-one thousand pounds, would cost in Austria thirty-seven thousand pounds. I know this statement is free from all exaggeration, and I quote it as a consolatory truth, which manufacturers may admit with confidence.

The *extra* cost of a cotton mill of 24,000 spindles, is 16,000, at 5 per cent. per annum	£800
For wear and tear, and less value, at 8 per cent. . . .	1280
Extra expenses in Austria on 24,000 spindles, per ann.	£2080
24,000 spindles require a 100-horse power steam engine, which consumes 1800 tons of coals per annum, at 7*s.* per ton .	£630

A good deal is said about the economy of water power in Switzerland and Austria; and it is certainly an economical first mover in countries where coals are so exorbitantly dear; but the above plain calculation proves, that, when compared with the advantages which we enjoy of cheap machinery, the former sinks into comparative insignificance. We see that twenty-four thousand spindles are worked by the consumption of eighteen hundred tons of coals, at the cost in Manchester of six hundred and thirty pounds per annum, or less than a third of the extra annual expense incurred by dear machinery on the continent. Water, as a moving power, is subject to many inconveniences of a local nature, as well as occasional stoppages from flushes or frost. A waterfall is often a heavy purchase, and, applied to spinning and manufacturing purposes, requires to be aided by a steam engine.

The price of coals in the principal mannfacturing districts on the continent, is correctly stated as follows: Alsace, 34*s.* per ton; Rouen, 30*s.*; Lille, 24*s.*; Sedan and Elbeuf, 34*s.*; Ghent, 20*s.*; Verviers, 22*s.*—Average, 27*s.* 4*d.* per ton.

The price of coals in Switzerland, Austria, Germany, and Italy, will be found to average 34*s.* per ton.

In support of what is here advanced, and to show by facts how little British manufacturers have to fear from foreign competitors in third markets, it is only necessary to read the following extracts of evidence, given before the Superior Commission of Inquiry, at Paris, in 1834, already referred to in these pages:—

"M. MIMEREL, PRESIDENT OF THE CHAMBER OF COMMERCE, EXAMINED.

Q. "How many cotton manufactories are there in the arrondissement of Lisle?

A. "There are one hundred and fifty cotton mills, with six hundred thousand spindles, giving employment to one hundred thousand hands, of all ages, in the different departments of spinning, weaving, and manufacturing. We employ United States cotton chiefly. We buy it at Havre; Liverpool is a much better market for the purchase of the cotton wool: there is a difference in these two markets equal to 10 per cent. in favour of the English spinner. This opinion has been contradicted, and I have been at some pains to verify my calculations. The information that I have obtained, from most authentic sources, establishes 10 per cent. in favour of Liverpool. But the English, more expert than we are, draw from an inferior quality of cotton a much superior yarn. To spin No. 120, they would take cotton at 1*s.* 10*d.*, whilst we should be obliged to use cotton at 2*s.* The English manufacturer has, besides, coals, lighting, iron, machinery, and repairs cheaper than we have. The whole of these advantages amount to no less than 28 per cent. in favour of the English spinner. English workmen are more experienced than ours; they do more work, and do it much better, for the same amount. With a mill that costs twenty thousand pounds, an English spinner will produce twice the quantity that we can in France.

Q. "What combustible do you employ, and what is its value?

A. "We use coals, which we get from Mons, for which we pay twenty-four shillings per ton.

Q. "What difference do you find between French and English-made machinery?

A. "We have very good machines made in France, and in this respect we have nothing to envy the English.

"M. FAUQUET LEMAITRE, DELEGATED BY THE COTTON SPINNERS OF ROUEN, EXAMINED.

Q. "How many cotton mills are there in your department?

A. "Two hundred and forty mills, with nine hundred and sixty thousand spindles.

Q. "What is the importance of your spinning mills?

A. "I have four mills, and upwards of forty-five thousand spindles, which cost me 33*s.* per spindle.

Q. "What combustible do you use?

A. "Coals from Mons; they cost at Rouen 38*f.* 50*c.*, equal to 32*s.* per ton.

Q. "Are your machines made in France, and are they as good as English machines?

A. "They are made in Alsace, and imitate closely the best English machines. The price is 30 to 40 per cent. dearer than English machines,

The English possess in great abundance the three things most essential to every kind of manufactures—iron, coal, and lighting. The carriage of these materials costs excessively dear in France. The topographical figure of England renders the carriage of them easy and cheap in that country. All her manufacturing provinces enjoy the same advantages; whilst in France a great part is entirely deprived of coals, and those provinces which do procure them, pay an exorbitant price. Compare this with Alsace, the most industrious of all our provinces, which is situated at more than one hundred and fifty leagues from any sea-port, and all its manufactures surcharged with extraordinary expenses.

Q. "What is your opinion upon the question now agitating before the Council? Do you think that the prohibition may be replaced by an import duty, calculated so as to protect our industry against foreign competition?

A. "I do not think that would be a good means, not being in a position to produce so low as our neighbours. With us, every thing is dearer; iron, copper, coals, carriage, and, in general, everything which we employ in our establishments, is in England much cheaper. Before replacing the present prohibitions by a duty, it would be necessary that France was traversed by canals and railways, and that we have the raw material at the same price; and, in short, the same advantages as the English: before this, it must not be thought of. We have just had the proof of this, on the finer number of yarns, the results of which have been disastrous; viz., Messieurs Nicholas Schlumberger wrote me, about fifteen months ago, '*that their establishments were in such an advanced state of perfection, that they were no longer afraid of English competition.*' This same house, writes me to-day, '*that it has no longer any outlet for its produce, and that it is crushed by foreign competition.*' If this is the case with fine numbers, what would be our situation if the coarser numbers were allowed to be imported? The English, who produce such masses of them, would encumber our markets for years.

Q. "Do you think, if a duty of 30 per cent. was imposed, and exactly levied, that the English would encumber our markets?

A. "I have no doubt of it."

(To be continued.)

INSTITUTION OF CIVIL ENGINEERS.

"Description of a Coffer Dam used in excavating rock from the navigable Channel of the river Ribble." By David Stevenson.

The navigation of the river Ribble being much impeded by natural bars or weirs of sandstone rock, compact gravel, or loose sand, several ineffectual attempts were made to remove these hindrances, and eventually a joint stock company, called the Ribble Navigation Company, was formed for that purpose. Messrs. Robert Stevenson and Sons (of Edinburgh) were consulted, and under their directions the present works were commenced: their plan was to cut a channel in the rock wherever it was necessary, and to remove the gravel and sand by steam dredging, forming at the same time a low rubble wall upwards of a mile in length, for the purpose of directing the course of the river so as to obtain a permanent and straight navigable track for the shipping. The first of these operations is alone treated of in the communication.

About half a mile below Preston, a bed of sandstone rock, upwards of three hundred yards in length, stretches quite across the river; some portions are entirely free from any deposit of sand or mud, and the higher parts are frequently left dry during the summer months. This natural weir exerts such an influence upon the flow of the tides, that neap tides, which at twelve miles distance rise 14 feet, are not at all perceived at the quay at Preston.

It was proposed to cut a channel through this bar, 100 feet in breadth, affording an average navigable depth of 20 feet at high water of spring tides. In some places, therefore, the excavation would be 13 feet 6 inches deep. After much consideration it was determined to make use of a series of coffer dams, as the most effectual and economical mode of proceeding. Their construction may be thus briefly described:—

A double row of wrought-iron bars, 2½ inches diameter, with jumper points worked upon them, were inserted vertically into the rock at regular intervals of 3 feet apart laterally, the second row being placed 3 feet behind the front row. When a sufficient number of bars were fixed, a tier of planking, 3 inches thick, with clasps to enable the planks to be fixed to the rods, was placed within side. The lower edges of the planks were cut out roughly to the inequalities of the rock; they were then lowered, and by means of an iron rod, with a crooked end, those parts which did not touch the bottom were ascertained, and a change in the form made, until the plank rested its whole length on the rock: the lower edge was then bevelled off, and being finally lowered to its place, the plank was beaten down by the force of a heavy mallet, upon an upright piece of wood resting upon the upper edge of the planks; the lower bevelled edge yielding to the blows, sunk into the irregularities of the rock, and thus ultimately, in connexion with the puddle behind it, formed a perfectly water-tight joint. The lower planks being fixed, the upper ones were placed upon them; transverse tie bars were inserted at intervals; and the clay puddle was formed in the usual manner. In order that the navigation of the river should not be impeded, the diagonal stays were all placed inside the dams. These stays had joints at the upper ends, and being slipped over the tops of the iron rods, and kept in their places by cotters, their lower ends could be moved either horizontally or vertically, as the irregularity of the rock required:—as the excavation proceeded, longer stays were easily substituted, by merely removing the cotter, sliding up the short stay, and replacing it by another suited to the increased depth. The sides of the dam were kept together by bars of iron connected to two horizontal wale pieces, 10 inches by 6 inches, placed on the outside of the vertical iron rods. When the dam was thus constructed, the water was pumped out by a steam engine of ten-horse power, with two pumps of 12 inches diameter.

The whole of the excavation, which was 300 yards in length, and 100 feet in width, was to be completed with three lengths of coffer dams, so contrived as to include within the second stretch the lower side of the first dam, in order to excavate the rock in which that row of piles was fixed. The first and second lengths have been most successfully executed; the third is now in progress, and the excavation is proceeding very rapidly. The sandstone rock does not require gunpowder. The total quantity to be excavated is estimated at 31,000 cubic yards; all the stone which is raised is used in the construction of the wall for directing the course of the lower part of the river.

Some doubt existed in the mind of the engineer as to the security of the fastening of the iron rod piles by merely jumping them from 15 to 18 inches into the rock; they have, however, proved to be perfectly firm during heavy floods, when the whole dam has been submerged, and the velocity of the current which was rushing over it was not less than five miles per hour.

This paper was accompanied by two drawings, showing the general arrangement of the work, as well as the details of the construction of the coffer dam.

"On the new form of Railway Chairs and improved Fastenings." By Charles May, Assoc. Inst. C. E.

At the suggestion of Mr. Cubitt, V.P., a series of experiments was instituted at the works of Messrs. J. R. & A. Ransome, of Ipswich, for the purpose of determining the most advantageous form of the chairs, and most secure mode of fastening them upon the sleepers of the South Eastern Railway. The result of these experiments has been to produce the cast-iron chairs, and wooden treenails as fastenings, which were exhibited at the meeting, and described by the Author.

In the event of a chair breaking, it is desirable that the fracture should occur in such a manner as to prevent any of the loose pieces being thrown into situations where they would interfere with the passing trains; to ensure this, the weakest part of these chairs is across the seat—they are, however, stronger in that part than any other chair now in use. In order to ascertain the proper relative proportion between the strength of the jaw and that of the seat, many experiments were made by varying the forms, and wedging the chairs until they broke, some times in one and at other times in the other part; it was then easy to add so much strength to the jaw as would, without waste of metal, cause the fracture to take place invariably across the seat.

For the purpose of ensuring perfect accuracy of form, with a smooth internal surface, so that wedges of a uniform shape and size might be used, the chairs are cast upon metal cores; the joint-chair has an upper piece, overlapping the wedge, to keep the rail in a perpendicular position, and to prevent the end of it from being thrown up or forced away laterally, if the wedge should accidentally be removed. This form of chair was originally planned by Mr. John Harris, the engineer of the Stockton and Darlington railway, where it has been in use above twelve months, giving perfect satisfaction. The rail is so placed in the intermediate chairs, that when it receives the pressure of the wedge, it is held firmly down on the seat, against the lower part of the jaw, and at the upper part against a slightly projecting rib, which bears against the neck of the rail.

The holes for the fastenings are so arranged as not to be in the same line; a large portion of the current expense of the maintenance of way on railroads arising from replacing the sleepers which have been split by the spikes being driven in the same line in the grain of the wood.

The mode of fastening adopted in this case is, to use treenails of dry English oak, compressed into two-thirds of their original bulk, by being forced under a fly press, into metal tubes, in which they are placed in a chamber heated to about 180°, where they remain sixteen hours: the pressure upon the body of the treenail (the head not being compressed) is sufficient to materially increase the specific gravity without injuring the fibre, or diminishing the strength of the wood, and it retains the form thus given until it has been driven into a damp sleeper, when the expansion is sufficient to fix it firmly.

The ordinary mode of fastening chairs with iron spikes has been found disadvantageous, because one blow too many causes a reaction, and frequently loosens them, whilst treenails may be driven to any depth, and the heads subsequently split with small wedges if necessary.

Rails should be 'keyed-up' so tightly as to ensure security, still leaving a large amount of surplus strength in the chair to resist any shock to which they may be exposed:—with wedges of varying dimensions, the chairs, which are frequently of unequal quality, and carelessly cast, are liable to be brought nearly to the breaking point, and to give way as soon as they are subjected to any additional strain. This has been avoided in the chairs and wedges under consideration, by giving them exact uniformity of dimensions.

The wedges adopted are of English oak, cut out of square timber, so formed as to drive equally well with either side to the rail, and compressed into five-sixths of their bulk, by the same process as is used for the treenails.

Many advantages will result from this form of chair and wedge, with the treenails for fastening; the time occupied in laying the rails is diminished; the holes for the fastenings may be bored in the sleepers by machinery, at a diminished cost, and greater accuracy of gauge obtained at the same time; the required inclination of the rail being given in the chair, no cutting away of the sleeper is necessary; the sole of the chair is fixed horizontally upon the surface of the sleeper, and all of them may be placed accurately in the same plane, thus bringing to bear upon the hitherto roughly executed details of railway engineering, those mechanical contrivances by which the cost is diminished, whilst the dependence upon the skill and attention of the work is avoided; at the same time insuring the accuracy of the line, upon which so large a portion of the economy of working a railway depends.

Specimens of the chairs, wedges and treenails, accompanied this communication.

Mr. Cubitt observed, that two modes of preparing treenails had been hitherto adopted: one was, by forcing the wood through a steel die, in which case neither the form nor the diminished bulk was preserved, as on leaving the die it swelled nearly to its original size. The other was by passing the wood between rollers: this latter process had been found to cause permanent injury to the fibre of the wood, by crushing the capillary tubes, and consequently depriving it of much of its strength. To the mode of preparing the treenails under consideration, neither of these objections existed. He anticipated many advantages from the use of this form of chair, wedge, and fastening. They would certainly be cheaper even in the first cost than the ordinary chairs, fastened down by iron spikes. The usual calculation for a double line of rail was £880 per mile for the chairs, wedges, and spikes. The cost of these chairs, with the compressed wedges and treenails, would be £786 per mile. The price of the compressed treenails for railway purposes would be £5 10*s.* per thousand; that of iron spikes was £6 5*s.* per thousand. The wedges 2¼ inches square, cost £2 per thousand for each inch of their length, so that those for the joint-chairs, which are 8 inches long, average £16, and those for the intermediate chairs, of 6 inches long, cost about £12 per thousand. Each joint-chair, with wedge and treenails, costs two shillings and tenpence; and the intermediate ones, with their appendages, two shillings and one penny each.

One great cause of expense on railways was the fracture of the chairs during the laying. He knew an instance where in a length of twenty miles of railway 180 tons of chairs had been broken, either by wedging or in driving down the spikes. This was in the ratio of one chair in ten. In the ordinary mode the oak wedges are driven home by a 14 lb. sledge hammer, whereas with the new chair the compressed wedges and treenails are driven by a light wooden mallet.

Mr. Pim remarked that the wood fastening used for the chairs on the Dublin and Kingston Railway had been compressed by rolling. He considered the present plan much superior.

Mr. Vignoles corroborated the statement of the cost of chairs of the ordinary construction. On the railways of the north of England oak treenails had been used as fastenings for a considerable period. The plan now proposed presented many advantages, not only in the construction of the chairs, which appeared well designed and excellently cast, but in the form and mode of preparation of both the wedges and the treenails.

In answer to a question from the President, whether the compressed treenails could be applied with advantage in ship building—Mr. Mills was of opinion they could be so employed, provided the fibre was not injured by the process. He believed that sound wooden treenails were better fastenings for ships than iron bolts, and quite as good as copper, whilst by their use the expense was materially reduced. Turned treenails of locust wood were at present preferred to all other kinds.

Mr. S. Seaward understood that, at the Royal Dockyards, treenails which were crooked as much as three times their own diameter were preferred to straight ones. He believed that the late Mr. H. Maudslay had constructed some machinery expressly for turning them crooked.

Mr. Hawkins remarked that the treenails were frequently crooked, because the rending caused them to follow the direction of the grain of the timber. Twenty-two years since, Mr. Annesley took out a patent for building ships without ribs. He used for fastenings, treenails compressed by being forced through steel dies, just before driving them into the planks, so that their expansion fixed them firmly in the planking. He built a vessel of very light construction, the sides of which were formed of five thicknesses of ¾-inch boards, held together by compressed treenails, without any ribs. It had proved very stiff and durable.

In reply to a question from Mr. Vignoles, whether the swelling of the compressed treenails in the ribs would not have the effect of preventing the possibility of the "butt end" of a plank starting—Mr. Mills believed that such an event was of rare occurrence; treenails were subjected more to a lateral strain; they were frequently "backed out" after the planks had been fitted into their places: when the latter were properly bent they retained their shape, and had no tendency to spring out.

Mr. S. Seaward, in support of the opinion that leaks did occur from planks starting, instanced the "Marquis of Huntly," East Indiaman which was injured in the Downs, by a collision with another vessel; she proceeded on her way to China, but during the whole voyage out and home forty extra men were employed at the pumps. On being taken into dock, it was found that the "butt end" of one of the bow planks had started for 8 or 9 feet in length, and nothing but constant labour and attention had kept the ship afloat, at an additional expense of £7000 to the owners.

RAILWAYS IN THE UNITED STATES.

A LIST of all the railways in operation and in progress in the United States up to the year 1840, gives some interesting results. In the state of New York there were 27 railways, 22 of which were in operation. The New York and Erie, which is to extend, when completed, 454 miles, was progressing, but no part was opened. It was chartered in 1832, and was estimated to cost 1,234,567*l.*; average cost per mile, 2,720*l.* The New York and Albany is also among the number not at present in operation. Its length is 140¾ miles, and it was chartered in 1832. When completed, its total cost will be 579,220*l.*; average cost per mile, 4,115*l.* The New York and Haarlem, which is in operation, only extends 7¾ miles, yet in its construction it is said to have been the most expensive in the Union. It was chartered in 1831, and opened in 1839. Its total cost was 240,741*l.*; average cost per mile, 31,802*l.* In the state of New England there were 21 railways, of which 19 were in operation. The Norwich and Worcester appears to be the chief; it is 59 miles long, and in full operation. It was chartered in 1832, and opened in 1840. Total cost, 303,496*l.*; average cost per mile, 5,144*l.* In the state of New Jersey there were 7 railways, and all in operation. The Camden and Amboy extended 61 miles, with a branch of 31 miles, and employed 17 locomotives. Total cost, 555,555*l.*; average cost per mile, 6,039*l.* In the state of Pennsylvania there were 36 railways, of which 29 were in operation. The Philadelphia and Reading, 102 miles in length, 54½ of which is in operation, and the Philadelphia and Columbia, 82 miles in length, and in full operation, appear to be the two chief. The total cost of the former is estimated at 944,520*l.*; average cost per mile, 9,260*l.*, and the total cost of the latter, 823,000*l.*; average cost per mile, 10,037*l.* In the state of Delaware the only railway was the Newcastle and Frenchtown, 16 miles in length, and completed. The total cost of it was 82,336*l.*; average cost per mile, 5,146*l.* In the state of Maryland there were 8 railways, of which 6 were in full operation. The Baltimore and Ohio was 435 miles in length, but 350 miles yet remained to be opened. It was chartered in 1827, and was first opened in 1834. Its total cost was estimated at 2,685,255*l.*; average cost per mile, 6,173*l.* The Eastern Shore Railway was laid out as 118 miles in length, but was only progressing. It would, it was estimated, cost 311,520*l.*; average cost per mile, 2,640*l.* In the state of Virginia there were 10 railways, of which all were in operation, and two only remained to be entirely completed. One

of these was the Richmond, Fredericksburg, and Potomac, the largest in the state, it extending 75½ miles. Four miles remained to be completed. It was chartered in 1834, and opened in 1837. Its estimated cost was 302,000*l.*; average cost per mile, 4,000*l.* In the state of North Carolina there were 3 railways. The Wilmington and Raleigh was 161 miles in length, and in full operation. The total cost was estimated at 370,300*l.*; average cost per mile, 2,300*l.* In the state of South Carolina there were 2 railways, one (the Charleston and Hamburgh) extending 136 miles. It was in full operation. Total cost, 494,000*l*; average cost per mile, 3,633*l.* In the state of Georgia there were 4 railways, 3 of which were in full operation. In the state of Florida there were 4 railways, of which 3 were in full operation; the works of the one, called the Alabama, Florida, and Georgia, which was to extend 156½ miles, had been suspended. In the state of Alabama there were 7 railways, of which the Selma and Tennesse was the greatest work; it extended 170 miles, but no portion of it was at present opened. It was estimated to cost 340,000*l.*, average per mile, 2,000*l.* In the state of Louisiana there were 10 railways, the principal of which were in operation, but the New Orleans and Nashville was not yet completed. In the state of Mississippi there were 5 railways; the Mississippi was 140 miles in length, but not yet completed. It was estimated to cost 700,000*l.*; average per mile, 5,000*l.* In the state of Tennesse there were 3; in the state of Kentucky, 2; in the state of Ohio, 6; and in the state of Indiana, 2 railways; the principal of which were partly opened, and all appeared to have been but recently chartered. In the state of Michigan there were 10 railways; the central, extending 196 miles, the southern, 189 miles, and the northern, 201½ miles, were three state works commenced in 1837, extending from east to west through the peninsula, and were estimated to cost upwards of 1,332,000*l.* Only 38 miles were at present completed, and they were upon the central line. In the state of Illinois there were 11 railways; 9 of which were state works, and would, it was estimated, cost 3,285,000*l.*; of these the central was the greatest, extending, as it did, 450 miles. The general results of this table show that railways have been introduced in 24 states of the Union; that the number of different lines of railways, either completed or in progress, is 179; that of these only 16 were undertaken by state Governments, and that the remainder were undertaken by about 160 different corporations, with or without the assistance of state Governments; that railways were first chartered in America in 1826; that the first railway was opened in 1827, and was the Quincy, in Massachusetts, only 4 miles in length; that the total length of railways in operation, either completed or only part completed, is 3,430 miles, while the total length of all the railways in operation or in progress is 9,378 miles.

MINE VENTILATOR.

Among recent applications of mechanical powers of the simpler class, we notice with considerable pleasure that of a machine for ventilating mines, and for displacing stagnant air from any position where other means may have failed to afford a necessary supply of the purer element.

The machine to which we allude, is an eccentric fan with four or more vanes, contained within a strong coating of iron, in connexion with wheelwork, by which it is made to revolve with great rapidity. For mine work, the machine is attached to the projecting end of a tube carried to any given depth, and the unfailing effect of its action is a displacing of the impure air, and a substitution of that which is requisite to sustain life. It is equally effective for ventilating ship's holds, and buildings where large assemblies are collected, securing in either case a constant supply of fresh air. We know many instances where the adaptation of these simple machines would preserve life, and can enumerate others, where they would afford indemnity against the inconvenience and unhealthiness of a high temperature and tainted atmosphere.

Most of our readers will remember the almost enthusiastic praise bestowed upon that eminent philosopher and chemist, Sir Humphrey Davy, for having successfully devoted his attention to a means of protection against the explosion of fire damp in mines. But the safety lamp, however perfect in itself, needs also careful management in the mines; any attempt to open the lamp in localities charged with an excess of hydrogen, being instantly fatal to all within reach of the ignited gas. The air extractor, on the contrary, effects the double purpose of immediately ridding the mine of noxious air, independently of attention on the part of the workmen, and of obviating the stoppage of works which, on this account, so frequently occurs in mine districts.

In confirmation of the practical usefulness of the machine, we have lately been shown a letter from a gentleman who superintends the works of Tamar silver lead mines, Cornwall, where one of them, made by Mr. Nicholson, C. E., of the Panclibanon, Baker-street, London, was applied to extract the foul air from a depth of 115 fathoms, with an additional 100 fathoms of level, which it performed with surprising quickness and effect. This result, together with the very cheap rate at which it can be supplied, has brought it into extensive demand; and we have no doubt the mere sense of duty, upon the question of humanity towards workmen in situations exposed to danger from foul air, exclusive of other and important advantages, will induce inquiry, on the part of proprietors of mines and others, into the validity of information which we are gratified in being the first to communicate.—*Post Magazine.*

LIST OF PATENTS,

Continued from page 168.

(SIX MONTHS FOR ENROLMENT.)

Joseph Ratcliff, of Birmingham, manufacturer, for "certain improvements in the construction and manufacture of hinges for hanging and closing doors," being a communication. Sealed August 4.

Owen Williams, of Basing Lane, London, engineer, for "improvements in propelling vessels." Sealed August 4.

John Lee, of Newcastle upon Tyne, manufacturing chemist, for "improvements in the manufacture of chlorine." Sealed August 4.

James Warren, of Montague Terrace, Mile End Road, for an "improved machine for making screws." Sealed August 4.

Stopford Thomas Jones, of Tavistock Place, Russell Square, gent., for "certain improvements in machinery for propelling vessels by steam and other power." Sealed August 4.

William Craig, engineer, Robert Jarvie, rope-maker, and James Jarvie, rope-maker, all of Glasgow, in the kingdom of Scotland, for "certain improvements in machinery for preparing and spinning hemp, flax, wool, and other fibrous materials. Sealed August 11.

Samuel Brown, of Gravel Lane, Southwark, engineer, for "improvements in the manufacture of metallic casks or vessels, and in tinning or zincing metal for such and other purposes." Sealed August 11.

John Seaward and Samuel Seaward, of the Canal Iron Works, Poplar, engineers, for "certain improvements in steam engines." Sealed August 13.

William Hale, engineer, and Samuel Dell, merchant, both of Woolwich, for "improvements in cases and magazines for gunpowder." Sealed August 13.

John Harvig, of the Strand, gent., and Felix Moreau, of Holywell Street, Millbank, sculptor, for "a new or improved mode or process for cutting or working cork for various purposes." Sealed August 21.

John Harvig, of the Strand, gent., and Felix Moreau, of Holywell Street, Millbank, sculptor, for a "new or improved process or processes for sculpturing, moulding, engraving, and polishing stone, metals, and other substances." Sealed August 21.

John Thomas Carr, of the town and county of Newcastle-upon-Tyne, for "improvements in steam engines," being a communication. Sealed August 21.

George Hickes, of Manchester, for "an improved machine for cleaning and freeing wool and other fibrous materials of burs and other extraneous substances." Sealed August 21.

Charles de Bergue, of Broad Street, London, merchant, for "improvements in axletrees and axletree boxes," being a communication. Sealed August 21.

Frederick de Moleyns, of Cheltenham, Gloucester, gent., for "certain improvements in the production or developement of electricity, and the application of electricity for the obtainment of illumination and motion." Sealed August 21.

William Walker Jenkins, of Greet, in parish of Yardley, Worcester, manufacturer, for "certain improvements in machines for the making of pins, and sticking the same into paper." Sealed August 27.

Edward Morewood, of Highgate, Middlesex, gent., for "an improved mode of preserving iron and other metals from oxydation or rust," being a communication.—Sealed August 27.

Miles Berry, of Chancery Lane, Middlesex, engineer, for "certain improvements in the means and apparatus for obtaining motive power, and rendering more effective the use of known agents of motion," being a communication.—Sealed August 27.

Samuel Hardman, of Farnworth, near Bolton, Lancaster, spindle and fly maker, for "certain improvements in machinery or apparatus for roving and slubbing cotton and other fibrous substances."—Sealed August 27.

Thomas Chambers, and Francis Mark Frankling, of Lawrence Lane, button warehouseman, and Charles Rowley, of Birmingham Warren, button manufacturer, for "improvements in the manufacture of buttons, and fastenings for wearing apparel."—Sealed August 27.